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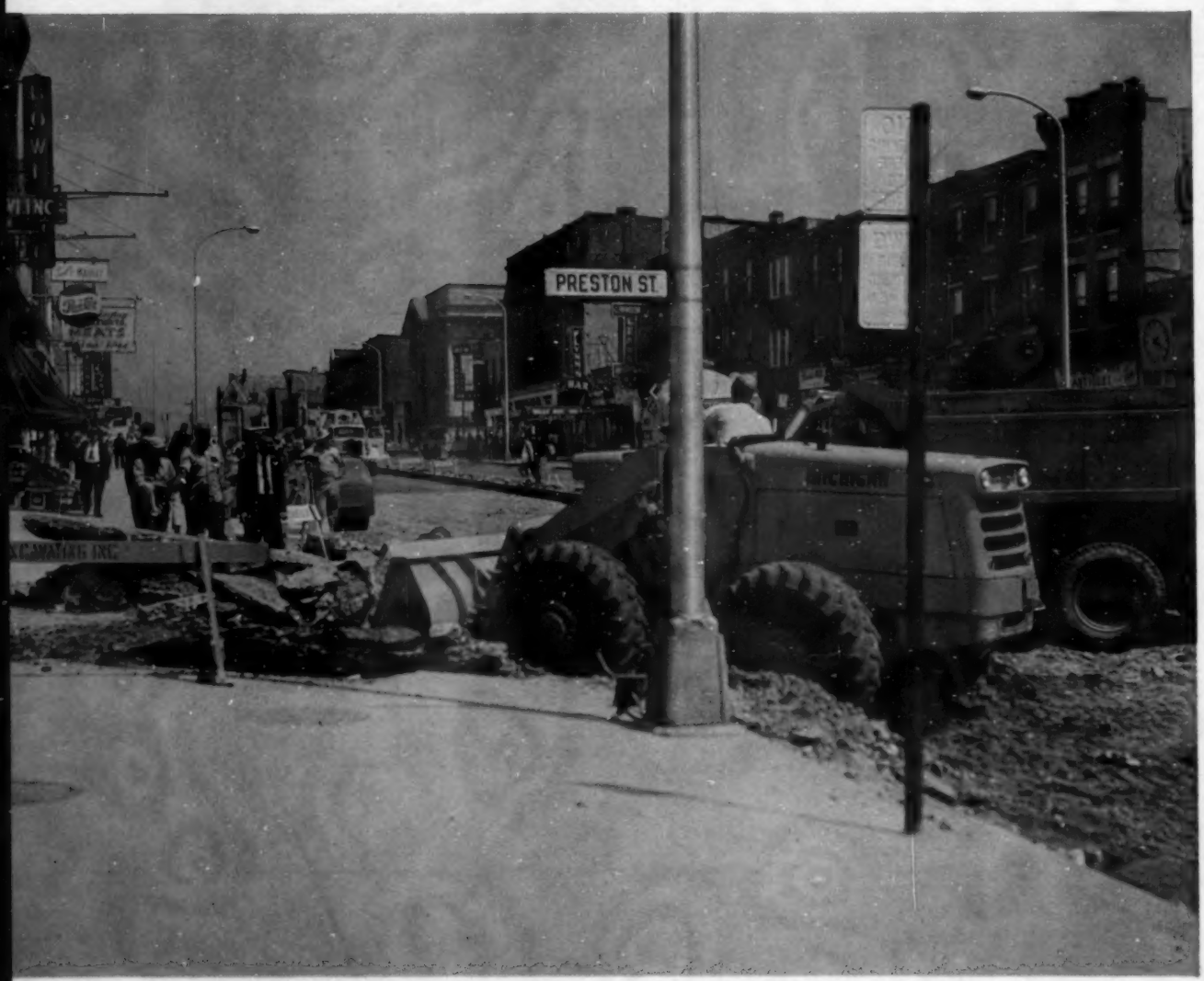

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October 1957

Crane-of-all-work

THE ROUSTABOUT—manufactured by the Hughes-Keenan Corporation—is a highly versatile, highly maneuverable motive crane. It has an extremely short turning radius, travels at speeds up to 15 m.p.h. All three crane operations—swinging the boom, raising and lowering the boom, working the hoist line—can be performed simultaneously or independently. All six models (5 ton capacity shown) can be specially equipped for construction work, in-plant or out-plant materials handling. To assure maximum power efficiency and dependability, Roustabout Cranes are powered by big-output, heavy-duty Chrysler Industrial Engines.

CHRYSLER INDUSTRIAL 30

(230 cu. in. displacement) powers the 3, 4, 5, 6 ton models of the Roustabout Crane. (Industrial 32, 265 cu. in. displacement powers 10, 12½ ton models.) Both of these in-line six engines also power many other makes of equipment in the construction and materials handling fields. There are four Chrysler in-line 6s, two V-8s—ranging from 230 to 354 cu. in. displacement.

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INDUSTRIAL ENGINE DIVISION • CHRYSLER CORPORATION

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☐ For engineering information ☐ For descriptive literature

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CITY ZONE STATE

New Pennsylvania Turnpike Tunnel Links Philadelphia and the Poconos

A major link in the Northeastern Extension of the Pennsylvania Turnpike between Philadelphia and the North is the new Lehigh Tunnel through the Blue Mountain west of Palmerton, Pa. The tunnel is 4,379 ft long, and provides for two lanes of traffic, separated by a concrete divider. The interior finish is tile, and illumination is furnished by some 800 fluorescent lights.

In all, more than 37,000 cu yd of concrete were placed in the tunnel, including the roadbed. Bethlehem supplied a number of steel products for the tunnel as well as for all sections of the Turnpike, including reinforcing bars, bar mats, dowel units and other highway steels.

The Northeastern Extension of the Turnpike starts at Plymouth Meeting and presently extends to Wilkes-Barre. It provides access between the Philadelphia metropolitan area and the industrial, farming, and Pocono Mountain resort areas to the north.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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ROADS AND STREETS

A GILLETTE PUBLICATION • OCTOBER, 1957 • VOLUME 100 • NUMBER 10

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Coming Articles

Portfolio of Prestressed Concrete Bridges
Pictures and "how erected" data on a selection of concrete bridges in various states, showing techniques for transporting and lifting precast units into place.

Vibratory Compaction in Sandy Materials
How small steel rollers with vibrators have done most of the compaction on an airbase project (Griffiss, Rome, N. Y.), involving 7,600,000 cu.yd. of sand fill and 700,000 cu.yd. of granular subbase.

Tractor-Mounted Drill-Application
As noted on New Mexico Interstate relocation project (U.S. 85), where a 700,000 cu.yd. rock cliff has had to be blasted alongside the existing highway and the main-line Santa Fe.

Interstate Projects Beginning to "Roll"
Starting a series of project reviews covering noteworthy developments of interest to contractors and engineers on selected Interstate expressway jobs: Wyoming (U.S. 30), Idaho (U.S. 10) and others.

Other Articles Coming Soon
Minnesota's flexible base: how contractors are getting the job done under varying conditions . . . Hardfacing: what the contractor needs to know about its potentialities for cutting equipment maintenance . . . The new tricks in getting super-smooth runways for high-speed jets (two project reports) . . . Baltimore's new expressway that straddles a roaring creek (and the contractor's woes) . . . Tractor-mounted and other large drills: When to move them in and what to expect of them . . . And watch for reports on autumn conventions.

Accepted as Controlled Circulation Publication at Milwaukee, Wisconsin. Published monthly. Subscription $3.00 per year.

▲ One of "the earth-movin'est earth-movers around," Holloway Construction Co., Livonia, Mich., proved it again when grading for relocation of U. S. 16 at Brighton, Mich. Work started 12 days after job was let—and 6 miles of sand, clay and muck up to 40 feet deep were hustled as never before. Tires shown are Goodyear TUBELESS Sure-Grip Lug—built with triple-tempered TRIPLE-TOUGH 3-T NYLON Cord.

▲ GOODYEAR BIG TIRE SERVICE at Holloway's U. S. 23 relocation job at Fenton, Mich. Strategically located, well-equipped, well-manned service like this cuts down time to a minimum wherever Goodyear helps jobs roll. Tire shown is Goodyear TUBELESS again!

80% CUT in earth-mover tire down time!

*That just **begins** your savings with 3-T Nylon Cord*

TUBELESS TIRES!

ON JOB AFTER JOB, contractors agree that tube and flap troubles cause up to 80% of tire down time. End tubes and flaps and those troubles end, too—and you also save on tube replacement and inventories.

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YOU SAVE TIRES, TOO—for with Goodyear TUBELESS, small injuries usually show *before* they get serious.

So be sure you specify Goodyear 3-T Nylon Cord TUBELESS tires on all new equipment—and see your Goodyear dealer for change-over of present vehicles. Goodyear, Truck Tire Dept., Akron 16, Ohio.

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ALL-WEATHER EARTHMOVER

HARD ROCK LUG

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ROAD LUG

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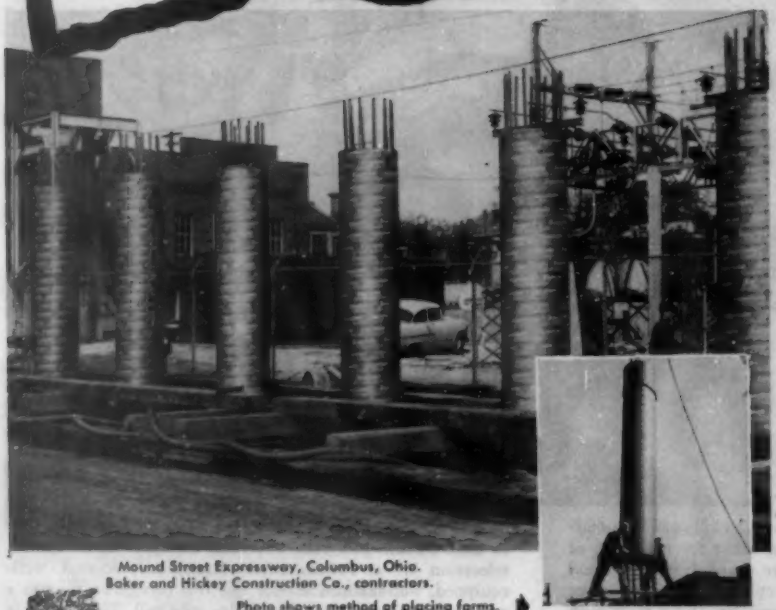
Reinforced round concrete piers support elevated expressway!



Mound Street Expressway, Columbus, Ohio.
Baker and Hickey Construction Co., contractors.
Photo shows method of placing forms.

Low cost, easy-to-handle

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All over the country, more and more contractors are using these fibre forms for piers, piles, underpinning and supporting columns because they save time, money and labor!

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Here, the K-45 Kompactor works up close—eliminates hand tamping on this California job.

The K-45 Kompactor meets density specifications in fewer passes, faster, and at less cost.

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CONNECTICUT TURNPIKE CONSTRUCTION: Savin Construction Corporation Division of Merritt-Chapman & Scott is building four sections of this $398,000,000 project, and is also building a section of the new Massachusetts Turnpike. All Savin's equipment is Texaco-lubricated.

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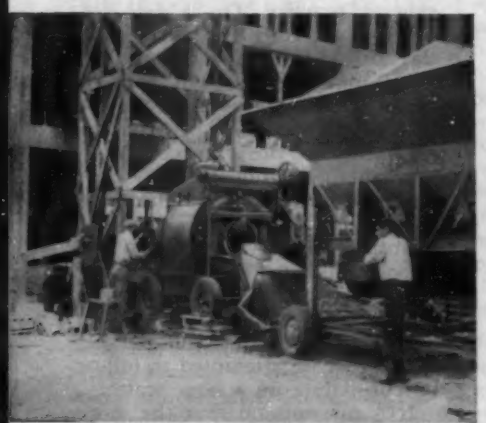
LOADS TRUCKS — Producing concrete for curbs and gutters, a Kwik-Mix 16-S Dandie mixer dumps batch directly into truck from ground level. Tower loader attachment gives 9 foot-2 inch discharge height. Big-capacity bucket holds full 17.6 cu. ft. mixer batch. It is powered by the mixer engine, dumps automatically at top of tower. Bucket travel and discharge are completed while the next batch is being

SETS UP AS CENTRAL-MIX PLANT — on bridge construction, two Kwik-Mix 16-S Dandie concrete mixers, with wheels removed, were set up side-by-side as permanent mix plants. Both were equipped with tower attachment for truck-loading operation. These big-capacity mixers also can be set up as stationary plants on elevated platforms by adding an extension track to charge the drum.

LOADS CONCRETE BUCKETS — Working on a state highway relocation project, this mobile 16-S Dandie mixed concrete for a series of box culverts — discharged batch into concrete bucket. To suit operating conditions, this versatile Kwik-Mix 16-S mixer is adaptable to side or end discharge. Axles are readily interchangeable on the square mixer frame. Change-over is easy, takes less than an hour.

KWIK-MIX COMPANY, Milwaukee 16, Wis. (Koehring Subsidiary)

mixed. There's no delay to mixer production. Tower is easily attached. Top section is hinged, folds back for ample travel clearance. Tower loader attachment is also available on the 11-S Dandie concrete mixer, and on Kwik-Mix 10 and 14 cu. ft. bituminous mixers.



TEAMS UP WITH BATCHER — Concrete for a new apartment building was produced on the job by this Kwik-Mix 16-S mixer and Johnson Lo-Bin batcher — a low-cost, big-production team. (Other sizes in Kwik-Mix line include: 11-S, 6-S, 3½-S Dandie mixers.)

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Johnson ⅜ to 3-yard Clamshell Buckets

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KOEHRING Company
Milwaukee 16, Wisconsin

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ON ROAD WORK–

Tamping fill around 4 ft. concrete pipe culvert on New York State Thruway Extension near West Seneca, N.Y. The Barco Rammers are owned by S. J. Groves & Sons Co., Syracuse, N.Y.
(Photo: CONSTRUCTIONEER)

Barco Rammers are Essential!

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LETTERS To the Editor

To the Editor:

I believe like Joel I. McGregor, August Roads, that there is a need for protective seal for asphalt pavements. Also, I feel that Mr. Nevitt could be too directional in attempting to gain all the characteristics of a desirable pavement surface by paving mixture design.

With the tremendous areas of off-street asphalt pavement, variously subjected to surface deterioration factors, it seems highly desirable that special surface treatment be recommended for selected areas. Considerations along this line I believe to be essential for a 'rational engineering approach' to the total problem.

W. G. Nickol,
Albuquerque, N. Mex.

To the Editor:

(In answer to a request for comment on the practice of asking contractors to bid on work on a per-mile basis.)

New Mexico has had only a few cases of difficulty on projects where certain items of construction were bid on a per-mile basis. The experience has led us to believe that this procedure is not feasible as a general practice. On a few secondary projects where the terrain was considered suitable, grading items were set up on a per-mile basis. These projects proved to be sources of contention between the contractor and the project engineer, over whether or not the grade lines were laid on standards higher than anticipated, and whether excessive quantities of subgrade material had to be handled.

While we were able to settle these complaints, it was an indication that we would run into considerable difficulty if we attempted to follow this procedure on a large scale.

It is my opinion that the more engineering we attempt to shift from the highway departments to the contractor, the more we will aggravate the engineer shortage which we are trying to overcome. A construction project requires a certain minimum amount of engineering. If the departments fail to furnish this and the contractors are forced to perform it for us, their

(Continued on page 16)

AUSTIN-WESTERN HYDRAULIC CRANE

HUNKIN-CONKEY REPORTS: A-W proves versatility, speed and economy on tough contracting jobs

Early in 1956, The Hunkin-Conkey Construction Co., a major contractor with home offices in Cleveland, undertook a reconstruction job at one of that city's large steel plants. Time studies showed that 95% of the lifts were within the 5-ton range, so a diesel-driven Austin-Western unit was purchased. It was equipped with an 18-ft. extensible boom and 6-ft. manual extension, plus 4-wheel drive, 4-wheel power steer and hydraulic outriggers.

The Company says: "During the first year of use, this crane operated on an average of 2 shifts a day with complete success. Because the construction contractor meets so many different operating conditions, versatility in a machine is most desirable. We found this quality built into our Austin-Western."

Does many jobs well. "With it we install such equipment as conveyors, motors and pumps . . . We use it with a hitch to haul trailers with up to 5 tons of reinforcing steel, and sometimes have hauled as many as 5 trailers in a string . . . In restricted areas we use it to pour concrete brought up from our redi-mix plant in trucks. Maintenance men use it for changing tires or wheels in the yard or out on a job, and to remove engines for maintenance or repair . . . It is a handy emergency unit to have in the equipment storage yard when not out on a job."

Safer to operate. "We find the A-W safer to operate, particularly in congested areas, because it permits less swing of the load. Its boom responds instantly to the operator's touch. The boom also hydraulically extends and retracts while rotating and raising or lowering."

Costs less than half one man's wage. "Our cost record shows a total machine cost, exclusive of overhead, of only $12.11 a day, less than half the operator's wages. The cost, with the operator's wage included, is just over $5 an hour."

For the complete Hunkin-Conkey story, ask for Gould Certified Report No. 5703.

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Surfaces lap-finished...

in the Le Roi Model C11 Breaker

Lap-finishing means the honing of surfaces to precision tolerances. For example, lap-finishing of the main piston bore after grinding increases breaker efficiency. This type of honing provides a better retaining surface for costly lubricant. Also, honing off the "high" spots cuts air consumption. This precise mating of parts is one reason why the C11 breaker outperforms and outlasts other makes.

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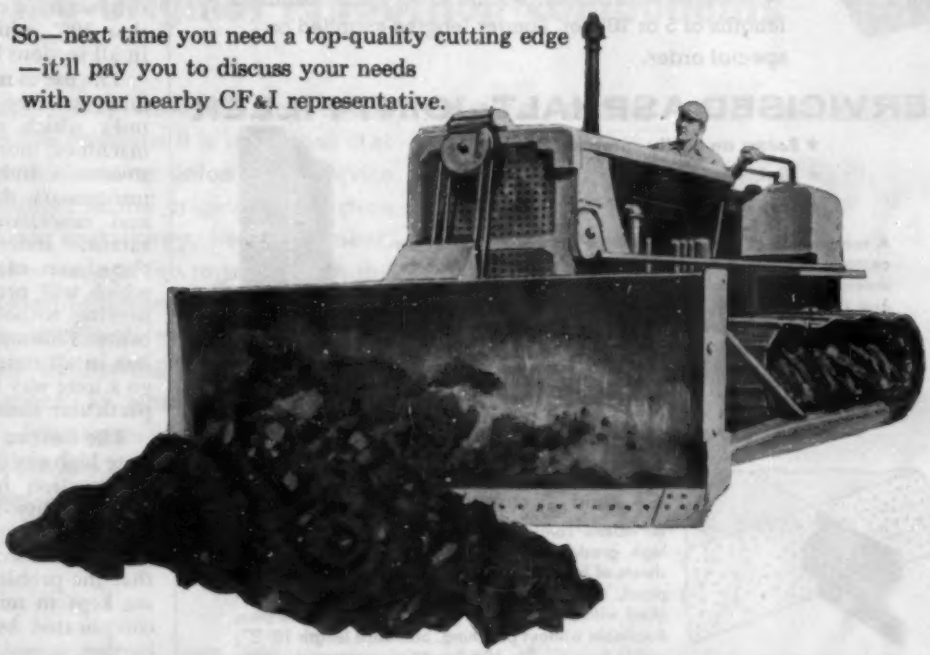
So—next time you need a top-quality cutting edge —it'll pay you to discuss your needs with your nearby CF&I representative.



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2. Recovers more than 80% of original thickness after compression
3. Low moisture absorption
4. Readily handled without breakage
5. Least expensive non-extruding type

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★ Forms an easily compressible cushion
★ Highly waterproof
★ Low in cost

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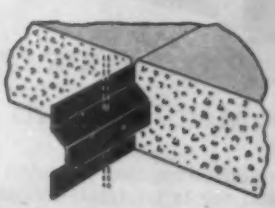
TONGUE AND GROOVE JOINT

★ Provides quick, low-cost tongue and groove joint for keyed slab construction
★ Rigid . . . easy to handle and install



Servicised Tongue and Groove Joint consists of a high grade asphalt mastic core formed between sheets of heavy asphalt saturated paper. It is waterproof, non-extruding and extremely durable. Supplied with punching for dowel bars and stake pins. Available without punching. Standard length 10' 2"; widths from 4½" to 10½" in 1" increments; thickness ½". Standard widths listed are for slabs from 5" to 11" thick.

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LETTERS TO THE EDITOR

(Continued from page 12)

source of engineering personnel is our own department. Few state highway departments can compete on salaries with their own contractors bidding against them for trained personnel.

Of equal importance is the fact that the end result will inevitably be higher construction costs. Successful contractors bid on what is evident on a project. If evident unknowns exist, they will naturally increase their bids to protect themselves from those unknowns. By the same token, if the contractor has a cost for most items of construction, he will bid his ability to perform the work in the most economical way with confidence that he will be paid for what work he performs.

We believe hence that shifting of responsibility is not the answer to the engineer shortage problem. Rather, the answer will be found in more modern engineering procedures. As evidence of this, our department will end this fiscal year with the accomplishment of having constructed approximately 2¼ times the dollar volume of work previously handled. While doing this, we have enlarged our staff less than 10%, which includes increases in all sections of the department.

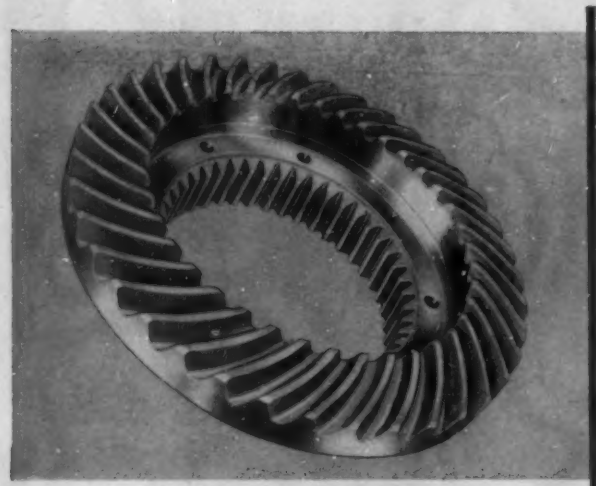
The use of more electronic equipment to free personnel of those tasks which can be handled by machines, more standardization of structures and design to cut down unnecessary duplication of effort, and miscellaneous short cuts to increase individual productivity—these are examples of practices which will provide adequate engineering without shifting responsibility. This may not solve the problem in all states, but we feel it will go a long way in taking care of our particular situation.

The Bureau of Public Roads, the state highway departments, and the construction industry have a co-responsibility in carrying out the expanded program. Each segment of this triumvirate must so operate that the problems of the other two are kept in mind and not further complicated by undue shifting of burden.

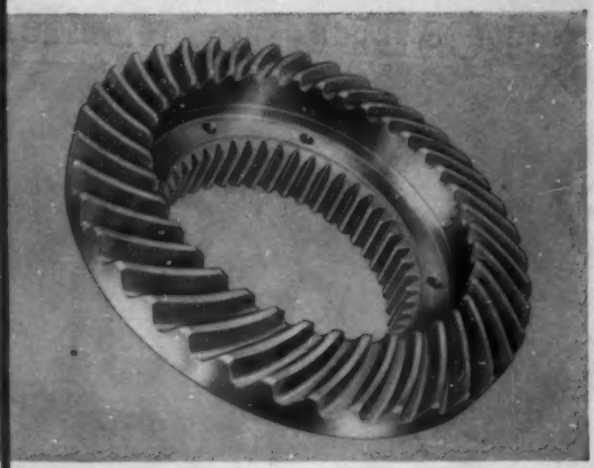
I sincerely hope the above will be of assistance to you

Donald R. Roser
Administrative Engineer,
New Mexico State Highway Commission,
Santa Fe

They May Look Alike . . . but they're Not!



Replacement Ring-Gear
Made by Eaton—Axle Division



Replacement Ring-Gear
Not Made by Eaton

Only Genuine Eaton Axle Service Parts are Identical to the Original Production Components

Even Eaton Axle parts may wear out and require replacement. When this happens it is important that repairs be made with Genuine Eaton Axle Service Parts. They are identical to the original production components in design, metallurgy, heat treatment, and quality of finish—made to run together with the other axle parts. Eaton replacement parts are held to the rigid quality standards established for axle components and will deliver the same dependable, low-cost kind of service. So when, after thousands of miles of trouble-free operation, it may become necessary to replace worn parts in an Eaton Axle, it's most economical to make these replacements with Genuine Eaton Axle Service Parts.

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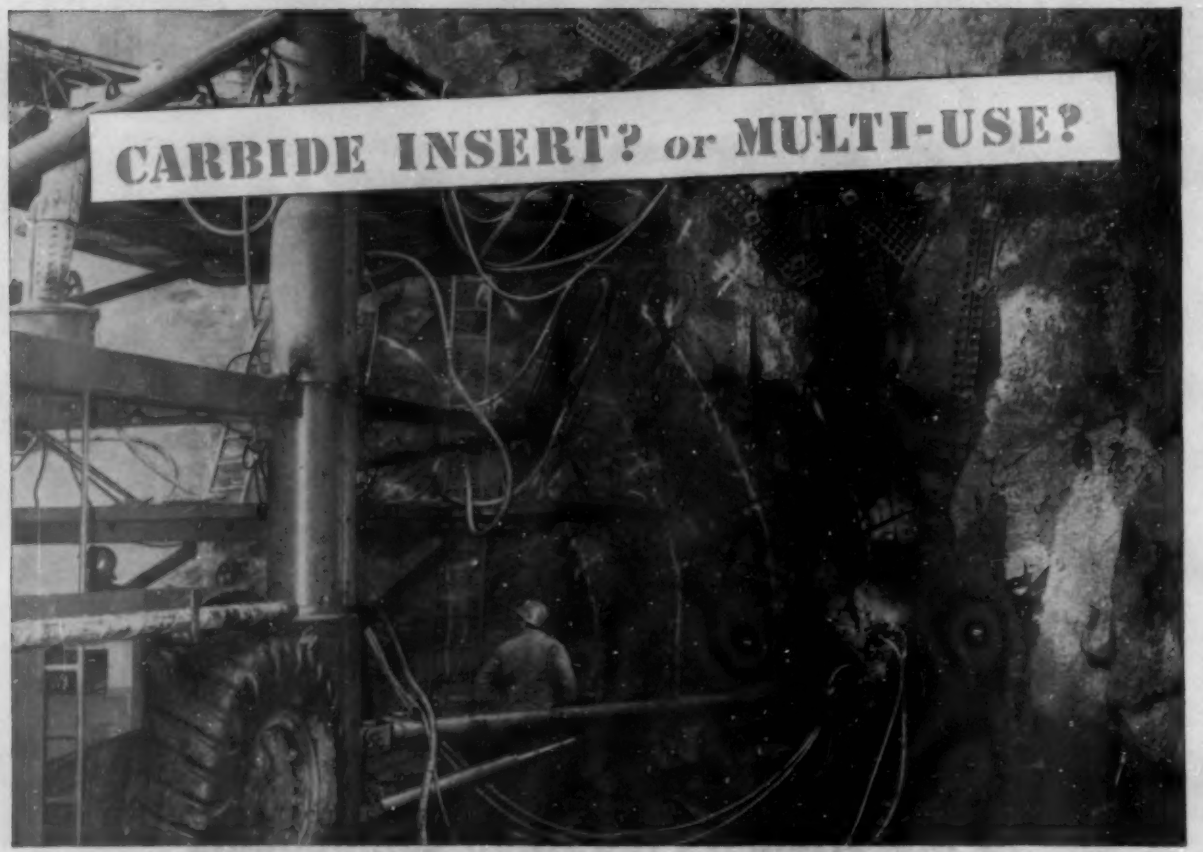

LOCATION: Mayfield Dam site, near Saukum, Washington. **OPERATING CONDITIONS:** Medium blocky basalt.

Increased drilling speed with TIMKEN® carbide insert bits saves time, labor on Mayfield Dam tunnel

DRILLING a diversion tunnel for the city of Tacoma's Mayfield Dam, Gibson and Roberts, rock drilling specialists of Yardley, Washington, had to chew through medium blocky basalt. For highest economy drilling through this hard ground, they used Timken® carbide insert rock bits with their jumbo drill rig.

Timken carbide insert rock bits permitted high speed drilling with fewest bit changes. With Timken bits the ground was drilled and blasted in one shift.

Under many tough drilling conditions, you can get top economy with Timken carbide bits. But carbide insert bits may not be best for every job.

In softer, less abrasive ground, Timken multi-use bits, correctly controlled and reconditioned, give you the lowest cost per foot-of-hole when you can drill out full increments of drill steel.

Whether your drillers use Timken multi-use or Timken carbide insert bits, they will save time because these bits are interchangeable in the same thread series. A wide range of different Timken bits fit the same drill steel. You can change bits right on the job, as fast as the ground changes. What's more, Timken rock bits are made from our own electric furnace fine alloy steel. And they have a specially developed shoulder union that protects threads from drilling impact.

To find out which type of Timken rock bit will do the best job for you write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

your best bet for the best bit ... for every job

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ROADS AND STREETS
Sixty-Five Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk October 10, 1957

Efforts to eliminate duplicate representation of the highway contracting industry are being explored in Washington by committees of the Associated General Contractors of America and the American Road Builders Association. AGC, representing highway as well as building and heavy construction contractors, feels its services to roadbuilders are being duplicated by ARBA. ARBA, whose strength is that it represents all segments of the roadbuilding industry, feels it must have a contractors division in order to preserve that broad representation.

Elements in both organizations, however, want closer cooperation between the two. The idea with much support is that the AGC Highway Contractors Division should represent the highway contractor, and AGC, in turn, and as an organization, should support the "good roads" efforts of ARBA. Both organizations have served the industry well. Many feel that their combined efforts might be more effective.

* * *

The official plan for numbering routes on the National Interstate System has been formulated by the American Association of State Highway Officials. To avoid confusion with existing U. S. routes, there will be no Interstate route in a state bearing the same number as a U. S. route there. Even-numbered routes will run east and west, odd-numbered routes, north and south - with numbering sequences starting in the South and West respectively.

A special route marker has been designed, too, from 27 suggestions offered by state highway engineers. It will be a 36 inch red, white and blue reflectorized shield. First signs will appear soon on completed sections of the 41,000-mile network.

* * *

A new policy memo describing how contractors must meet federal labor requirements on Interstate System work has been released by the Bureau of Public Roads. Under the revised procedure, roadbuilders must file a copy of each weekly payroll, a weekly anti-kickback affidavit, and a quarterly labor summary. (On other than Interstate jobs, the weekly payrolls only are not required.)

The labor reclassification procedure has been streamlined. If additional labor classifications are urgently needed to avoid undue delay, the contractor may use such classifications, but must make written application through the state highway department to the Secretary of Labor for a supplemental wage determination, and make retroactive adjustment if the subsequent wage decision exceeds what he is paying. Until last month, a contractor could not use a classification not listed in the wage schedule.

(continued on next page)

Uncle Sam has ladled out $6½ billion to the state highway departments within the last 13 months, Frank Turner, Bureau of Public Roads assistant commissioner pointed out the other day. That is more money than the entire national budget came to in any year from 1775 to 1934, except for the World War I stretch. Some $3.6 billion of this huge bonanza has not yet been requested by the states for future programs. Another $1 billion in the federal pot has only been earmarked for future state roadbuilding.

* * *

The Bureau is sitting on the lid, refusing - and wisely so - to divulge the new estimates states are sending in of the cost of their Interstate System mileage. However, signs are that the $27-billion network will cost considerably more than that now, and many here in Washington are dreading the day when Congress must be given the bad news. Many of the legislators who thought they had taken care of the highway problem once and for all with the Highway Act of 1956 are in for "a bit of a shock."

Construction costs have risen over 10% since the Bureau came up with the $27 billion figure. And whereas some states reportedly grossly underestimate their needs or measured them on the basis of lower design standards, no one expects them to soft-peddle their estimates this go-round.

* * *

The National Highway Program was the subject of consternation and dismay at a Hartford, Connecticut, conference last month where a conclave of planners deplored the effect new expressways would have on urban renewal. The cities aren't ready with redevelopment master plans yet, they declared, and the proposed facilities located where the state highway engineers want them will consolidate blight conditions. Several of the nation's foremost planners appealed for a two-year delay in the big construction effort, until the planners could catch up.

The few highway engineers present pointed out that the planners have been so ineffective, so controversial, or so conspicuous by their absence in many cities that the roadbuilders have had to proceed without them. In a number of communities, they said, the state highway department is the only organization with any long-range plans and the municipal government has produced nothing. (Watch for full report on this highly significant conference in next month's issue of Roads and Streets.)

* * *

The unkindest cut of all: Virginia's Legislative Advisory Council has effectively stifled hopes for a greatly expanded roadbuilding effort by recommending against a badly needed gasoline tax increase. And both candidates for the governorship have likewise declared themselves opposed to any new highway taxes.

But the reason given was like pouring salt in the wounds of an already hard-pressed highway department. The VALC pointed out that the department was short-handed engineeringwise and that it could not recommend additional taxes "until the time when the Department of Highways can show that it is well equipped to plan and supervise a (larger) construction program."

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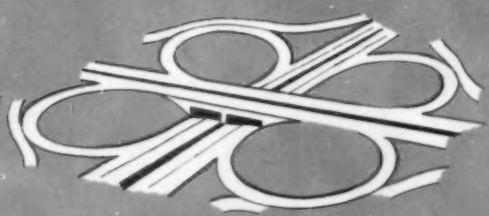

Today's concrete streets, roads and highways take a terrific pounding from an ever-increasing volume of traffic and heavier unit loads. They need all the extra strength they can summon to support such loads over longer periods without requiring extensive, expensive repairs. And that calls for steel reinforcing . . . with Clinton Welded Wire Fabric.

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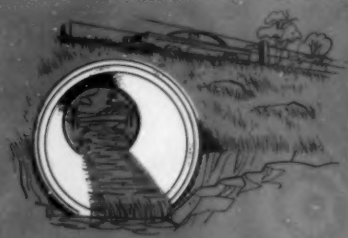

The structural strength to sustain heavy external loads and internal pressures, resistance to corrosive chemical reactions, smooth walls for free flow—these are some of the advantages in using concrete pipe for drainage systems, culverts and sewer lines.

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Hydrated lime on farm-to-market road in Kansas.
(Photo taken before lime was spread out and mixed with in-place material.)

Many secondary roads and residential streets fail due to the high clay content in the road base. Such roads can be reconstructed at low cost with lime stabilization, using small amounts of hydrated lime (2-4% by weight).

The construction procedure is simple and fast. Major steps include scarifying old surface, spreading lime, mixing and pulverizing, followed by compacting and rolling. Lime agglomerates the clay particles, reduces the plasticity (P.I.) sharply, creating a strong, stable and permanent base. An all-weather road results after a bituminous wearing surface is applied.

Costs are low (25-50¢/sq. yd. for 6 in. compacted base), since little or no additional base material is required. It is also unnecessary to excavate the old, troublesome base, which helps alleviate the grade line problem.

Lime stabilization is also practical for road shoulder construction, and for patching jobs. Maintenance forces will find lime a useful all-round material.

Lime stabilization — 10 to 12 years successful durability experience—over 1000 miles constructed.

Write for further information and FREE booklet:

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NATIONAL LIME ASSOCIATION
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COVER SCENE

Street Modernization That's Really Paying Off

An example of the additional traffic capacity which can be given to existing streets by means of systematic improvement, is shown by the transformation of Walnut Street, east-west arterial in Philadelphia. The Roads and Streets cover this month shows a Michigan 175-A loader on Armour Excavation Company's contract to reconstruct a segment of the street.

The improvements made and which have already increased the traffic capacity of various sections 43 percent, include the following:

1. The old double street car tracks were removed, and trolley busses substituted.
2. An elevated railway which straddled the street overhead since the war, was replaced by extending the city's subway system, thus removing another slowing element for motor vehicles.
3. The old rough pavement was reconstructed using p. c. concrete base and a high-type asphaltic surface. (The cover scene shows this work in progress, on one side of the street, with traffic being maintained on the other).
4. New modern street lighting has been progressively installed.
5. Line striping was placed to aid traffic flow.
6. Additional plans include center chanelization, improvement of traffic signals to provide variable-cycle progressive timing, which will result in an estimated increased street capacity of 100 percent over the 7,400 vehicles per day which was the average before improvements were made. (And will be done without widening the street).

Red Mud: Asphalt Additive

The proposal is made by Reynolds Metal Company, aluminum manufacturers, that highway engineers consider the use of Jamaica red mud as an additive in asphaltic paving mixes. This by-product in the manufacture of aluminum is a worthless material at present but is available in wide quantities in certain areas.

Dr. Tiemann, laboratory chief at Reynolds, thinks also that the stuff could be used to color cement and concrete paving and other products, or to lend a red tint to black top roads.

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AMERICAN BOSCH MAGNETOS

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AMERICAN BOSCH

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Partners Joe Duncan (left), and Johnie Arnett, Corsicana, Texas.

"THEY GET A FULL SHARE OF CREDIT F

Our Allis-Chalmers equipment has proved it can move dirt at low cost . . . and let us be low bidder time after time"!

Joe Duncan
Arnett & Duncan
Corsicana, Texas

Now building their 19th earth-fill soil conservation dam, Arnett & Duncan operate an equipment spread that includes both Allis-Chalmers motor scrapers and crawler tractors.

"With our Allis-Chalmers equipment, we can dig, haul and place dirt for a lower-per-yard cost . . . move as much dirt as higher-rated-capacity units," says Mr. Duncan. "The maneuverability and speed of our TS-360's and TS-260's cut cycle time, and the curved bowl bottom feature has brought a real boost to loading efficiency. Incoming dirt breaks up and rolls into the bowl for larger heaped loads.

"Our operators like our Allis-Chalmers equipment, too, because of the operating ease, riding comfort. You get a lot more production when your crew likes the equipment."

TS-360 motor scrapers (15 yd struck; 20 yd heaped), like that shown at left, are the "big guns" of the Arnett & Duncan fleet on earth-fill dam construction. Working with the TS-260's (11 yd struck; 14 heaped), they help make a high-production, low cost-per-yard team.

Top crawler tractor for these go-getting Texas contractors is the Allis-Chalmers HD-21—a product of 17 years of torque converter experience. ▶

Find out for yourself how the productivity of Allis-Chalmers construction machinery can help improve your profit picture as it has for these Texas contractors. Ask your dealer for all the facts—and a demonstration of real dirt-moving efficiency. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

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An exclusive rounded safety-top that eliminates "knife-blade" potential of straight edges . . . broad surface areas for greater light reflectance . . . extra deep corrugation to provide high impact resistance and prevent pocketing . . . these and other features make USF Barrier-Beam your best buy in guard rail. Erects fast, too . . . all splicing is accomplished off post. Full details and prices promptly furnished without obligation.

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Personals

Weber Appointed Chairman of AASHO Committee on Design

Carlos A. Weber, chief engineer, Michigan state highway department, has been appointed chairman of the design committee of the American Association of State Highway Officials, A. E. Johnson, executive secretary of AASHO has announced. Mr. Weber has been a member of the association's committee on Planning and Design Policies for several years.

The association's executive committee in selecting Mr. Weber said he was chosen because the committee felt the design chairman should be a chief engineering officer of one of the state departments, and should have experience as a member of AASHO's Planning and Design Policies group, so that he would be equipped to coordinate the two committees. Mr. Weber meets these requirements, having served on the latter committee at one time.

Carlos A. Weber

The design committee is responsible for developing and improving methods for both geometric and structural design of highways for the association. The committee generally meets twice each year, at the national AASHO convention held late in November or early December, and at four regional meetings. Regional sessions this year were scheduled during September at Richmond, Va., Columbus, Ohio, St. Paul, Minn., and Seattle, Wash.

(Continued on page 34)

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SPEED UP MOVING 6-MILLION YDS. OF DIRT FOR ALLEGHENY CONTRACTING INDUSTRIES ON HUGE $153-MILLION INDUSTRIAL DEVELOPMENT!

Here, as on thousands of other construction jobs, General Nygen Tires are proving that superior strength *plus* crawler-like traction and flotation, gets the job done faster and *for less!*

Built with exclusive stronger-than-steel Nygen Cord and featuring extra wide, extra deep treads, Generals are unequalled for deep-down drive and dependability.

Hand General Nygen Tires your toughest assignment today and watch them save time . . . build profits!

THE GENERAL TRUCK TIRE

specify GENERALS *on your new equipment*

THE GENERAL TIRE & RUBBER CO. • Akron, Ohio

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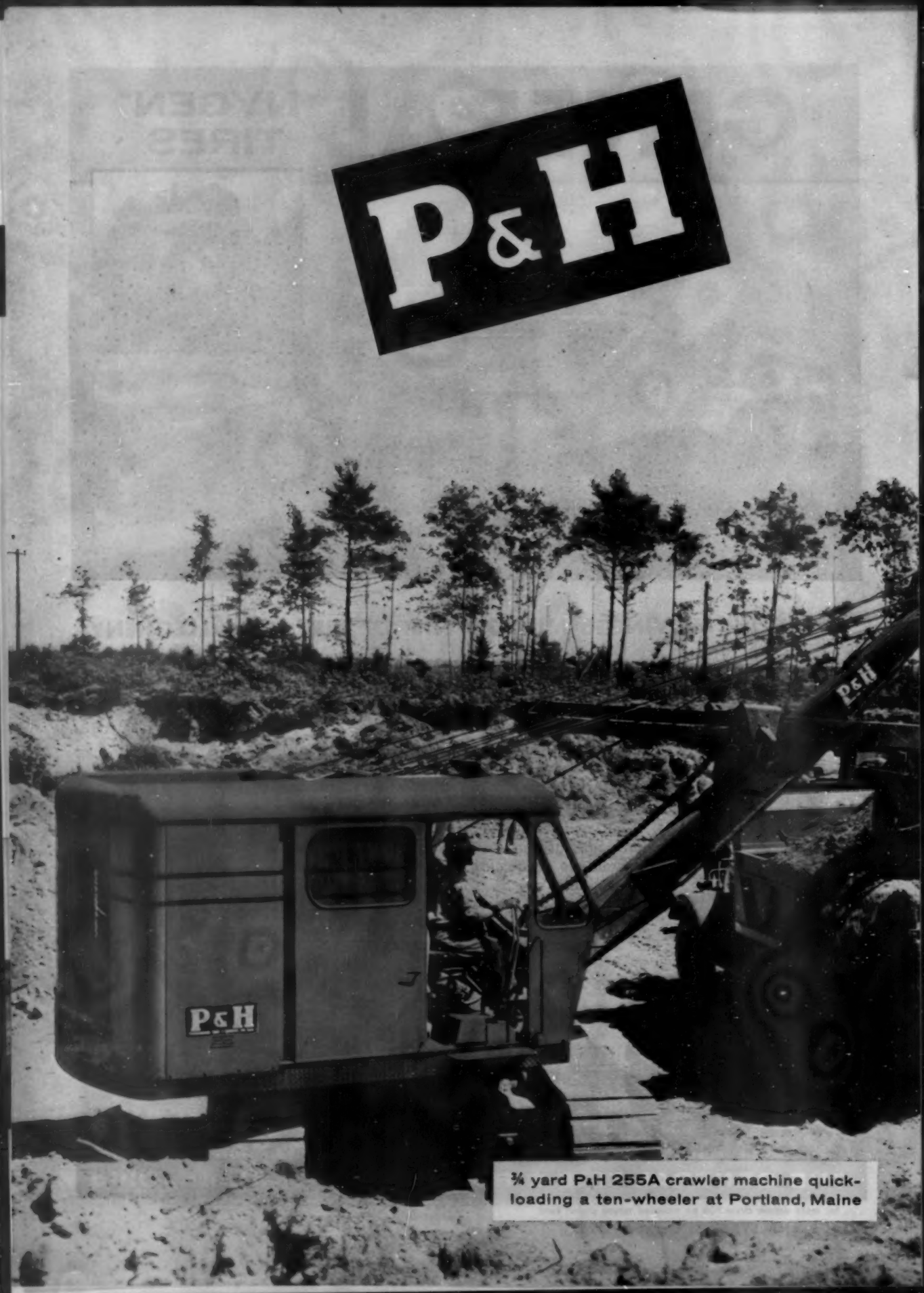

¾ yard P&H 255A crawler machine quick-loading a ten-wheeler at Portland, Maine

3/4 yd. shovel has a mighty appetite

P&H 255A–first ¾ yd. power shovel--still the leader

P&H was first to introduce a ¾ yard shovel with internal combustion engine and today the P&H 255A *continues* to lead in profitable performance.

Contractors agree that the 255A with its dependable day-in and day-out production can dig more and lift more—faster and cheaper. In fact, many contractors agree that performance of P&H equipment is the big factor in determining their profits.

P&H profitable performance comes from a combination of features that are found only in P&H quality equipment. In the 255A you get famous P&H stability through better weight distribution and a low vertical center of gravity. You get smooth, fast, lively swings on the mammoth P&H live roller circle. P&H designed double adjustable hook rollers assure "even keel" swings. The 255A makes maximum use of alloy steel.

Add to these features the fact that equipped with a P&H Diesel Engine with its greater torque you'll get much greater production than with a gas engine. Yes!—this ¾ yard excavator has the mightiest appetite for work—at a potential profit.

Harnischfeger Corporation
Construction & Mining Division
Milwaukee 46, Wisconsin

THE P&H LINE Truck Cranes: 8, 10, 15, 20, 25, 30, 35 and 45 tons
Shovels: ½, ¾, 1½, 1¾, 2½, and 3¼ yards

Across the country P&H machines lead the field in power, speed, flexibility, and profitable performance

CALIFORNIA
For handling loads up to 35 tons profitably there is the P&H 555A-TC. Here are Reliance Equipment's two 555A-TC units double lifting a precast concrete panel in the Vail Field Industrial Area, Los Angeles.

LOUISIANA
In the 1½ yard class, Schwartz Supply Co. profits from the lively swings and dependable performance of the P&H 655B. It is shown unloading material for their concrete mixing plant near New Orleans airport.

OHIO
Beavercreek Excavating Co. of Dayton depends on their ½-yard P&H 155A trench hoe to dig water mains and lay pipe economically and at a profit on State Highway 4 project in Butler County.

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Write today For Bulletin X-71 On the P&H 255A Fully Convertible Crawler Machine

Harnischfeger Corporation, Dept. 509-E
Construction & Mining Division
Milwaukee 46, Wisconsin

Gentlemen:
Please send me Bulletin X-71 on the ¾ yard P&H 255A

Name .....

Title .....

Firm .....

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City ..... *Zone*..... *State*.....

Most powerful, most economical V-8's

One of 9 reasons why contractors find International Trucks cost least to own!

Costs go down, profits go up with new INTERNATIONAL V-8's that have the highest horsepower in any commercial truck.

You have the power to get started and to keep moving . . . more miles per gallon on regular gasoline. Average speeds are higher with less shifting. You have ample power for all auxiliary equipment.

This is another example of INTERNATIONAL'S policy to build the best truck—to use only the finest parts and components with quality construction throughout—to spend more to build the truck so that it costs you *least* to own!

And INTERNATIONAL Trucks *do* cost *least* to own. This has been proved* by detailed fleet cost records.

Follow the lead of the men who know trucking costs to a penny . . . fleet operators who have made INTERNATIONAL the heavy-duty sales leader for the past 25 years. Make your next truck an INTERNATIONAL.

**Signed statements in our files, from fleet operators throughout the U.S., back up this statement.*

INTERNATIONAL HARVESTER COMPANY, CHICAGO

Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

1 Most powerful V-8's, up to 257 hp. Highest *usable* horsepower and torque at safe, economical rpm. These *truck* engines are built for lasting, superior performance and low maintenance costs . . . greater fuel economy on regular gasoline.

2 INTERNATIONAL tandems give longer, more dependable life. This unit has rubber bushings at all 10 oscillating points to reduce maintenance and lengthen life. Third differential with lock transmits power smoothly and evenly to each axle.

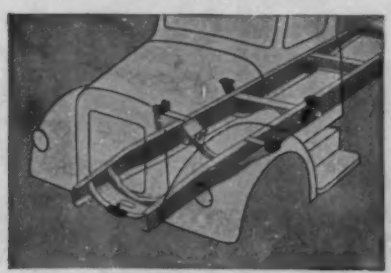
3 Rugged frame has plenty of sturdy crossmembers. Non-crystallizing, cold squeezed rivets are used for extra rigidity and proper flexibility on all types of service. Husky front and rear sections add to the safety margin built into every frame.

4 Cradle action front and rear springs cushion load and driver. Proper design and mounting provide better load support, smoother riding and longer spring life. Rear-shackled front springs for greater stability and increased life.

5 Full air brakes are standard or available on most models with lining areas to match the model, load and operating conditions. Twin-cylinder self-centering, self-energizing hydraulic brakes provide safer, easier stops and longer life.

6 Safer, easier steering and greater maneuverability result from cam and twin lever gears with controls mounted *ahead* of front axle. Steering wheel is comfortably positioned. Power steering available on most models.

New INTERNATIONAL V-Line trucks are powered by three great new V-8 engines, 206, 226 and 257 hp. Approved clean-burning LPG system also available. Offered in conventional and COE design, 4-wheel and 6-wheel models with GVW ratings from 24,000 to 60,000 lbs., up to 65,000 lbs. GCW. You name the job, INTERNATIONAL has the truck exactly right for your own hauling operation . . . "sized," powered and geared to cost you *least* to own.



7 For cab comfort and long life. Quiet, level ride without transmitting stress to cab, fenders, hood or radiator. It's the result of wide spaced, rear shackle type cab mountings plus exclusive INTERNATIONAL 5-point rubber-insulated suspension.

8 All-wheel-drive models have the extra traction and pull needed for all tough, off-highway operations. Completely factory-built models from 7,000 to 43,000 lbs. GVW. New Travelall shown offers sturdy six-cylinder power and performance.

9 World's most complete line. There is an INTERNATIONAL "tailor-made" for every job, half-tonners to 96,000 pounders. Choice of 4-wheel, 6-wheel and all-wheel-drive models, conventional and COE design. Every one built to cost *least* to own.

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LUFKIN

SUPER HI-WAY

DRAG TAPE

Extra heavy tape steel is etched away to leave full strength line with markings raised in bold relief. Raised protective edges and jet black background provide long wear and make markings easy to read. Chrome Clad finish resists rust and corrosion, won't chip, crack or peel. Each foot marked — end feet graduated to 100ths ft. 100 - 200 - 300 foot lengths.

BUY LUFKIN

TAPES • RULES
PRECISION TOOLS
FROM YOUR SUPPLY STORE

THE LUFKIN RULE COMPANY
Saginaw, Michigan

BETTER MEASURE WITH LUFKIN

398

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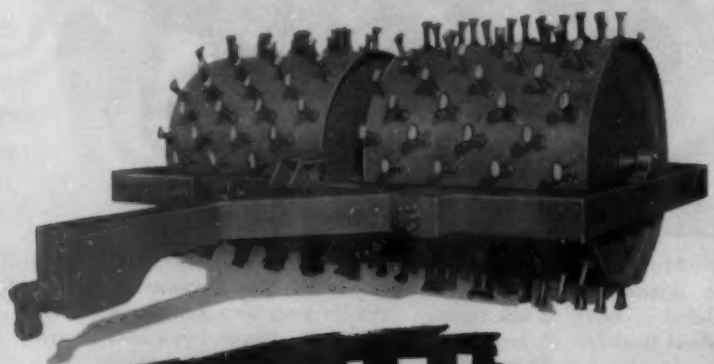

FLEXIBLE!

Diversified line

TAMPO'S *SHEEPSFOOT ROLLERS*

Greater production and easier pull. Tampo's independent drum oscillation and superior foot design gets more compacted yards per hour. There is a Tampo sheepsfoot roller model for every job and ground pressure. Write for latest bulletin and your dealer's name.

TAMPO MANUFACTURING COMPANY

DEPT. 2 • P. O. BOX 2340 • 1146 W. LAUREL ST.
SAN ANTONIO, TEXAS • PHONE: PE-3-9171

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Personals

(Continued from page 28)

The meetings concentrated on the design and development of interchanges, as one of the main distinguishing features between conventional highways and the Interstate system type of highway; and on a project for developing a manual for the structural design of pavements, both rigid and flexible.

ALBERT T. BLECK, assistant state highway engineer of Wisconsin, died recently at age 62. Mr. Bleck, who was a civil engineering graduate of Marquette University, started with the Wisconsin department as a draftsman in 1929. He rose to division engineer at Milwaukee and in 1934 became construction engineer, a post he held for two decades until being appointed assistant state highway engineer.

Mr. Bleck was widely known outside of his state for his work on national committees and in particular for his technical papers. One entitled, *Pavements and Influences Affecting or Determining their Performance,* is part of the Highway Research Board bulletin No. 20 on pavement performance.

HAROLD NEALE, who has been landscape engineer for the Virginia Department of Highways since the post was created in 1930, has retired. He was widely recognized as a pioneer leader in his chosen specialization, having been active on national committees.

Since 1937, he served as chairman of the Highway Research Board's Committee on roadside development and he has held membership also in a similar committee of the AASHO.

W. J. VAN LONDON, who was for many years engineer-manager of the Houston urban expressways for the Texas highway department, died recently at age 69 as a result of a traffic accident. London won a national reputation for his work in developing the Gulf Freeway at Houston.

T. C. POWERS, manager, Basic Research section, Portland Cement Association, Chicago, has received the Sanford E. Thompson award, from the ASTM for outstanding work in the concrete and concrete aggregate fields.

GALION GRADE-O-MATIC MOTOR GRADERS

GALION 1907 50 1957 ANNIVERSARY

Model T-700
190 h.p.
40,125 lbs.

Model T-600
140 h.p.
30,420 lbs.

Model T-500
125 h.p.
25,765 lbs.

Federal Highway Contracts Need
GRADE-O-MATIC PERFORMANCE

Galion GRADE-O-MATIC Graders are the result of BIG thinking for the BIG jobs ahead! Designed and built to smash the barrier of yesterday's narrow concepts of performance, they help operators achieve amazing results under every working condition.

Automatic torque multiplication as needed . . . power shifting . . . automatic adjustment of engine speed to the load . . . elimination of foot clutch . . . prevention of engine lugging and stalling . . . absorption of shock loads . . . utmost "push-power" at the blade — these features mean moving more material, in quicker cycles, with less operator fatigue, and less downtime for maintenance.

If you are faced with BIG jobs — it will pay you to get the facts on Galion GRADE-O-MATIC Graders. Write for literature today.

ESTABLISHED GALION 1907

MOTOR GRADERS · ROLLERS

TRENCH ROLLERS · PORTABLE ROLLERS · 3-WHEEL ROLLERS · TANDEM ROLLERS · MOTOR GRADERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices, Galion, Ohio, U.S.A.
Cable address: GALIONIRON, Galion, Ohio

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A-W Crushing Plant of J. J. Cronin Co., showing primary crusher at extreme left. Washer is in center of photo. Washed sand is delivered by the conveyor on left of washer, specification material by the three stock-piling conveyors at the right.

AUSTIN-WESTERN Crushing Plant giving high-speed production for J. J. Cronin Co., North Reading, Mass.

John Cronin reports: "We spent more than a month checking all makes before we purchased our Austin-Western plant in April, 1954. Since then, we have had every reason to be pleased with our decision. Production is fast, and we have very little downtime, as a result of the excellent engineering and rugged construction of the equipment. Present production includes: concrete sand and specification material in ½, ¾ and 1½ in. sizes."

In this operation, raw feed is delivered to a 36-in. feeder-grizzly combination and passes into the primary crusher, which has a jaw of 20 x 36 in. This is V-belt driven by a 75 hp slip-ring motor. The material is then conveyed to a 4 x 12 ft. single-deck screen. Larger sizes pass into a cone crusher, which is V-belt driven by a 60 hp slip-ring motor. The washer is a 4 x 16 ft., 3-deck screen type, equipped with spray pipes. A single convenient push button station controls the entire closed-circuit system.

It will pay you to compare Austin-Western design and construction features before you invest in a crushing and screening plant. Each Austin-Western plant is designed to solve a particular production problem. Our engineers would welcome the opportunity to discuss your needs with you and to recommend the proper equipment.

See your nearby Austin-Western distributor today, or write to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

AUSTIN-WESTERN
CRUSHING, SCREENING AND WASHING EQUIPMENT

BALDWIN-LIMA-HAMILTON
Construction Equipment Division — LIMA WORKS

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OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation
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ENDS MESS AND WASTE

NEW SINCLAIR LITHOLINE MULTI-PURPOSE GREASE CARTRIDGE

EASIER, FASTER, CLEANER LUBRICATION FOR CONTRACTORS

There's no mess, no spilling, no waste in filling your grease guns—when you use the new Sinclair LITHOLINE Multi-Purpose Grease Cartridge. Takes only seconds to pop a cartridge into the gun—and you're ready to lubricate. Fits all regular cartridge type guns.

Use Sinclair LITHOLINE for grease fittings on your equipment. It provides full protection against wear, rust, water—"stays put" under all conditions.

A Sinclair Lubrication Engineer will be glad to show you how the new Sinclair LITHOLINE Multi-Purpose Grease Cartridge can help *you*. Call your nearest Sinclair Representative, or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

SINCLAIR LITHOLINE®

MULTI-PURPOSE GREASE CARTRIDGE

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Spotting Sewer Pipe with Pin-Point Accuracy!

UNIT provides ample power maneuvers easily

Here is the ideal crane for placing pipe exactly where you want it...and placing it FAST. This sturdy, dependable machine provides easy maneuverability, plus precision-steadiness. The safety-promoting FULL VISION CAB gives the operator an unobstructed view of the entire operation, at all times. Makes pipe-positioning more efficient, safer, more profitable to all concerned. On other jobs, too, UNIT is equally satisfactory. It will pay you to investigate.

UNIT Models are available in ½ or ¾ yard Excavators... Cranes up to 20 tons capacity... Crawler or Mobile type... Gasoline or Diesel. All models convertible to all attachments.

UNIT CRANE & SHOVEL CORP.
[illegible] W. Burnham St. • Milwaukee 14, Wis., U.S.A.

Geared for Maximum Lifting Jobs

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A 8060-⅓-C

New Publications

Booklet on Highway Signs Available to Officials

The Douglas Fir Plywood Association has prepared a portfolio of information on the use of fir plywood for traffic control signs. Called "Facts About Fir Plywood and Overlaid Plywood for Highway Signs," it is a complete reference file on the subject for highway officials and traffic engineers.

Both regular exterior fir plywood and overlaid fir plywood (which has a resin-impregnated fiber face) are discussed. Contents include specification, procurement, and design data; case histories; field erection methods; and other background information for the highway sign specifier.

Copies of the portfolio are available without charge from Douglas Fir Plywood Association, Tacoma 2, Wash.

BASIC SOILS ENGINEER. By Professor B. K. Hough. The Ronald Press Company, 15 E. 26th St., New York 10, N. Y. 225 illus. and tables, 513 pages. Price $8.00.

This text book for undergraduates and practicing engineers offers a broad coverage of the fundamental aspects of soils, their properties and engineering behavior. Includes methods employed in solving day-to-day problems in practice, with special reference to procedures and equipment made available during and since World War II.

BOUNDARY CONTROL AND LEGAL PRINCIPLES. By Curtis M. Brown, 272 pages. John Wiley & Sons, Inc. 440 Fourth Avenue, New York 16, N. Y. Price $7.50. Covers legal principles for abstractors, surveyors, title engineers, attorneys and others in this work; a valuable reference in connection with right-of-way procedures.

ROADSIDE DEVELOPMENT, 1957. Report of the Highway Research Board Committee on this subject, comprising the Annual Committee Report and eight articles presented at the last annual meeting of the Board.

This issue is devoted in particular

(Continued on page 44)

MORE WORK-ABILITY

WITH THESE NEW "Euc" REAR-DUMPS

for construction, mine, quarry and industrial work

With overhung engine type tractors and full 90° hydraulic steering, these two new Euclid Rear-Dumps have excellent maneuverability for close quarter work and accurate spotting at loading and dumping areas. Big tires provide extra traction and flotation for soft fills and difficult hauls. The low over-all loading heights and rugged construction permit easy loading with all types of equipment. Smooth bodies with 3-stage, double-acting Euclid hoists assure quick shedding of loads.

Downtime and maintenance costs are held to a minimum as a result of the easy service accessibility of all major components. Interchangeability of the semi-trailer rear dump bodies with 7 and 18 yard scraper bowls provides extra flexibility for changing job requirements.

Your Euclid Dealer has detailed information on these versatile "Eucs" as well as other Rear and Bottom-Dump models, Scrapers and Crawler Tractors ... have him show you why ***Euclids are your best investment.***

EUCLID DIVISION, GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

THE

S-7

REAR-DUMP

12 tons payload ...
11 cu. yds. heaped ...
143 h.p. ...
18.00x25 tires ... top speed loaded of 26.5 mph ...
Torqmatic Drive .

AND THE

S-18

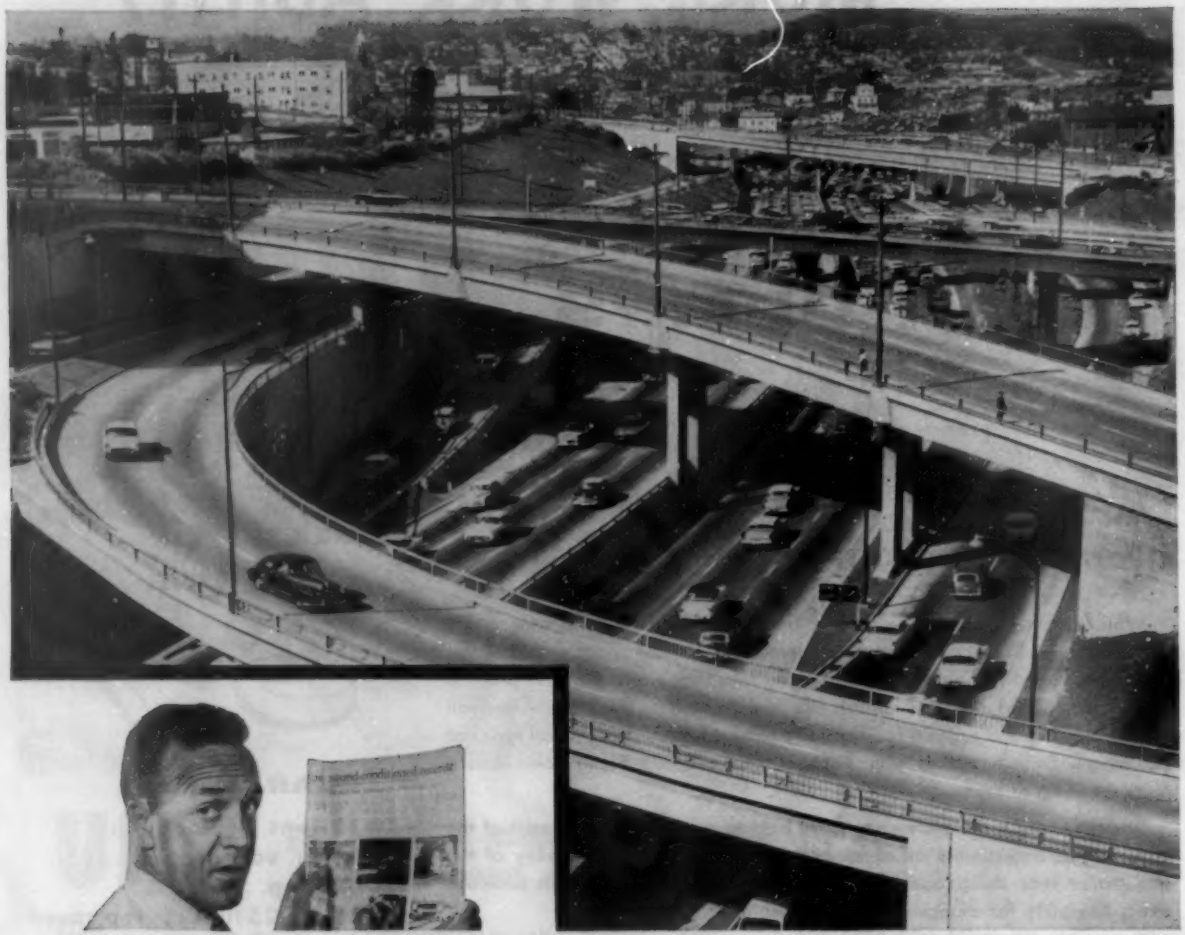
REAR-DUMP

35 tons payload ...
32 cu. yds heaped ...
300 h.p. ... 27.00 x 33 tires
Torqmatic Drive ...
NoSpin differential.

... For more details circle 265 on enclosed postal card

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE



Look of the future on newest highways calls for new-type concrete. Shown, interchange in Los Angeles.

What's all this talk about

NEW-TYPE, SOUND-CONDITIONED CONCRETE FOR THE INTERSTATE SYSTEM?

It's timely talk—in a new, informative series of PCA magazine messages to create fuller appreciation by the public for the finer, smoother-riding concrete highways being built today.

Significant advances mark today's newest concrete pavement. Highway engineers know about them. (Actually you may have helped develop them.) But—the *public?* Too few know of these advances . . . now so vital on the new Interstate System.

Take *sound-conditioning.* Admittedly, not a highway engineer's term! But it literally defines what has been done to concrete by use of narrow sawed joints for contraction control. The "thump" sound is gone—a dramatic advance! Drivers enjoy a quieter ride.

There's air-entrainment, too—and the granular subbase: both solved technical problems. But by insuring a lastingly smooth, level surface, they add new pleasure to driving. These and other advances today give people a pavement that is truly *new-type.*

All this needs telling. PCA's new nationwide campaign will do that—in non-technical talk the public can understand. An informed public means an appreciative public. This can simplify your job . . . it can help speed construction of the new Interstate System.

HERE TODAY! MORE COMING!

The public is enjoying new-type, *sound-conditioned* concrete on:

Ohio Turnpike
Atlanta Expressway
Hollywood Freeway
New York Thruway

and more than 3,500 miles of other modern highways.

NEW-TYPE Concrete

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

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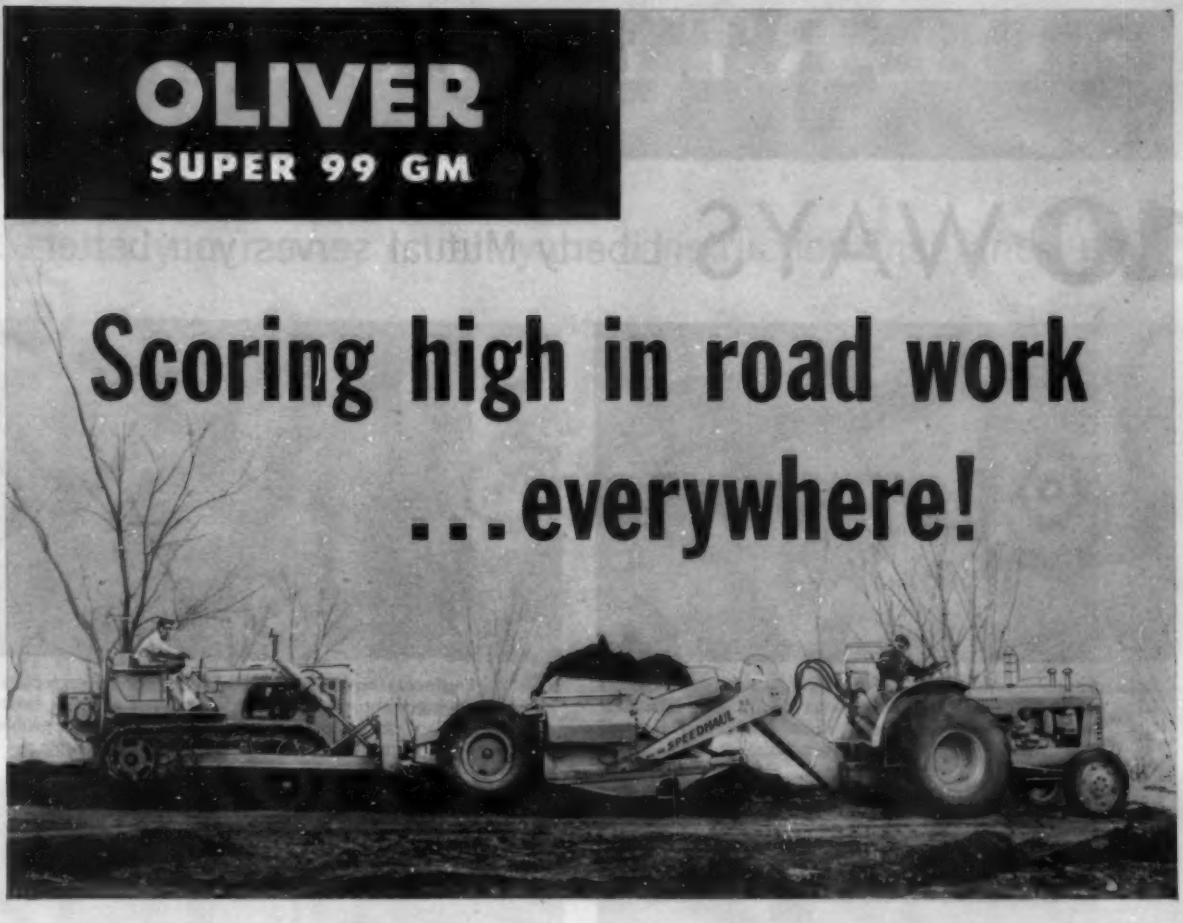
OLIVER
SUPER 99 GM

Scoring high in road work ...everywhere!



HERE'S WHY:

The Super 99 GM is the most powerful wheel tractor of its type.

This rugged 4-wheeler has the massive strength throughout for heavy load-lugging. With the popular General Motors 371 Diesel it delivers a full 77 drawbar h.p.—plenty for pulling scrapers, dump wagons, scarifiers, sheep's-foot and pneumatic rollers, scraper planes, etc.

Here's rubber-tire mobility with 6-speed transmission... ground-gripping traction at 2½ m.p.h. where the going's rough...speeds up to 13¼ m.p.h. for the long hauls. The Super 99 GM can replace heavier, costlier equipment in many cases. At the same time, it eliminates the risk of overloading medium-size tractors. Here's *one* prime mover sized right for *every* job.

Users report the Super 99 GM a big money saver on every score—fuel economy, easy servicing, freedom from repair bills. Best of all, it's priced for the small budget. Ask your Oliver distributor. Or write for Bulletin I-702.

OLIVER

THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors and matched allied equipment

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LIBERTY MUTUAL

10 WAYS Liberty Mutual serves you better . . .

1 **Advance analysis:** Liberty Mutual's construction engineers scrutinize your blueprints, equipment, falsework design, materials handling, traffic plans, etc. Control measures are practical, down-to-earth.

2 **Engineers on the job:** The Liberty Engineer reports to management on each work stage. He helps instruct workers, provides technical assistance on such problems as blasting, soil testing, and structural safety.

3 **Around the clock claims service:** Liberty has 1300 experienced claimsmen working out of 101 offices. They speed treatment of injured, investigate thoroughly, report promptly. Sometimes the claimsman lives on the job.

4 **Ability to follow your operations:** With offices throughout the United States, it's easy for Liberty to provide fast, experienced help on all jobs. Liberty has also provided insurance on many off-continent construction projects.

5 **Safety research:** Liberty has its own laboratory in which it studies overall construction safety, and solves specific problems encountered by individual contractors. Out of this have come many ideas for reducing construction accidents and costs.

6 **Speedy auditing service:** Liberty has its own auditors, specialists in the construction field, who provide fast auditing and assure proper allocation of payroll classification. They can save you money, and improve your position on competitive bids.

The Company that stands by you

and saves you money on all your construction insurance needs

7 **Unique medical program:** Liberty helps you set up a medical program on the job . . . gets medical care when a worker is hurt . . . has specialists who follow serious cases . . . provides rehabilitation centers for the badly injured.

8 **Direct dealing:** You deal direct with Liberty Mutual personnel — all full-time salaried employees of the company. This means you deal with your insurance company itself, not with a broker or middleman.

9 **Savings:** As a policyholder of Liberty Mutual, you share in the company's savings.* Through careful operating methods, substantial economies are produced. Dividends have exceeded $422,000,000 since 1912.
*All Liberty Mutual policies are non-assessable.

10 **Proved ability to lower your costs:** The chart above shows how one contractor lowered his cost 42% in 4 years through experience modification. Liberty Mutual can show you a large list of contractors whose insurance costs have been dramatically reduced.

LIBERTY MUTUAL — The number 1 writer of compensation insurance for 20 straight years.

If you'd like to see how your present insurance cost and service compare with what Liberty Mutual offers — clip and mail this coupon. A Liberty Mutual representative will call on you at your convenience.

LIBERTY MUTUAL INSURANCE COMPANY
LIBERTY MUTUAL FIRE INSURANCE COMPANY
HOME OFFICE: BOSTON

Offices in principal cities

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Liberty Mutual Insurance Company
175 Berkeley St., Boston, Mass.

Gentlemen:

I should like to compare my present insurance with Liberty's service and savings.

Name..... Title.....

Address.....

City..... State.....

ARROW *Mobile* HYDRAULIC HAMMERS

SPEED UP PRODUCTION

Cuts Costs on Cutting, Breaking, Tamping Jobs

Contractors — Cities — Counties — Public Utilites and others have found ARROW Mobile HYDRAULIC HAMMERS the most efficient, the most economical tool of its kind on a wide variety of jobs. Automatic Hammer Control and Exclusive Creeper Drive, plus operator-controlled impact permits fast, accurate breaking or cutting or tamping of any material to exact specifications. Get the facts about ARROW Mobile HYDRAULIC HAMMERS . . . they'll put money in the bank for you.

WRITE OR WIRE NOW FOR COMPLETE INFORMATION

ARROW MANUFACTURING COMPANY

194 WEST DAKOTA DENVER, COLORADO

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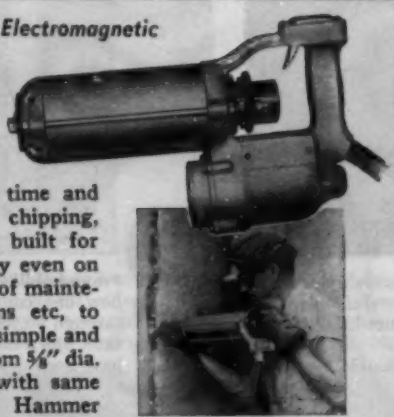
SYNTRON

ELECTRIC HAMMERS

Electromagnetic



Syntron Electric Hammers save time and lower job costs drilling, cutting, chipping, scaling paint, etc. Designed and built for continuous operation day after day even on the toughest jobs with a minimum of maintenance. There are no gears, cams etc, to cause down time. Maintenance is simple and low cost. Available in capacities from 5/8" dia. to 2" dia. holes. Also available with same capacities SYNTRON Electric Hammer Drills with automatic bit rotation.

Other SYNTRON equipment of proven dependable quality

MASS CONCRETE VIBRATORS

VIBRATORY COMPACTORS

GASOLINE HAMMER PAVING BREAKERS

Write for complete catalog data — FREE

SYNTRON COMPANY

384 Lexington Ave. Homer City, Penna.

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New Publications

(Continued from page 38)

to the problems of the Interstate Highway System as they pertain to landscaping and roadside development and maintenance.

A copy of this 88-page report is available at price of $2.00, at the Highway Research Board, 2101 Constitution Avenue, Washington, D. C.

ROAD RESEARCH 1956, ANNUAL REPORT OF THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, LONDON. 86 pages covering current problems, projects and progress. Price $1.04, including postage, remitted to British Information Services 45 Rockefeller Plaza, New York 20, N. Y.

SPECIFICATIONS & COSTS, 3rd Edition, Vol. II in a three volume series of Data Books for Civil Engineers, by Elwyne P. Seelye, 9 x 12, approximately 500 pages, with many tables. Price $20.00. John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y.

This volume is especially designed for use by a chief or administrative engineer, providing data necessary to prepare specifications for airports, roads, railroads, bridges, dams, docks, drainage and sewers. Data included which are considered necessary to selective design, and for analyzing costs of various types of work.

PHOTOGRAPHY AND AERIAL SURVEYS. A symposium. Bulletin 157, the Highway Research Board, 2101 Constitution Ave., Washington, D. C. Price $1.00.

This publication contains general discussion in addition to seven papers on aerial surveys and photogrammetry in highway location and design, as presented at the board's 36th annual meeting:

"Introduction to Photogrammetry and Aerial Surveys," by William T. Pryor; "Equipment, Methods and Standards of Accuracy Applicable to Aerial Surveys," by Robert D. Miles; "Relationships in Contour Interval, Scales, and Instrument Usage," by William T. Pryor; "Applications of Photogrammetry to the Location and Design

(Continued on page 48)

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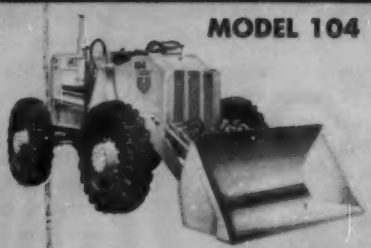
NOW...LOOK TO YALE&TOWNE FOR TROJAN TRACTOR SHOVELS

For almost 90 years the famous YALE trademark has appeared only on products of the highest quality. Today, the YALE trademark appears on the TROJAN line of tractor shovels — machines that have pioneered the development of many construction and operating features that have helped set a new trend in bulk material handling techniques.

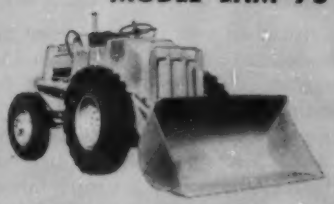
In the new line of TROJAN tractor shovels you'll find machines that will deliver extra digging power and faster loading ability — permit safe, fatigue-free handling because the operator is completely protected — operate efficiently and economically because every single feature is engineered to produce faster, smoother loading cycles.

This complete combination of desired features will demonstrate to contractors and public officials that only the best is good enough to carry the YALE trademark.

MODEL 154



MODEL 104



MODEL LHM 75

TROJAN
YALE & TOWNE

TROJAN®
®REG. U. S. PAT. OFF.

TRACTOR SHOVELS

YALE & TOWNE

2 & 4 Wheel Drive Front-End Loaders

CONTRACTORS MACHINERY DIV., THE YALE & TOWNE MANUFACTURING COMPANY, BATAVIA, NEW YORK; SAN LEANDRO, CALIFORNIA

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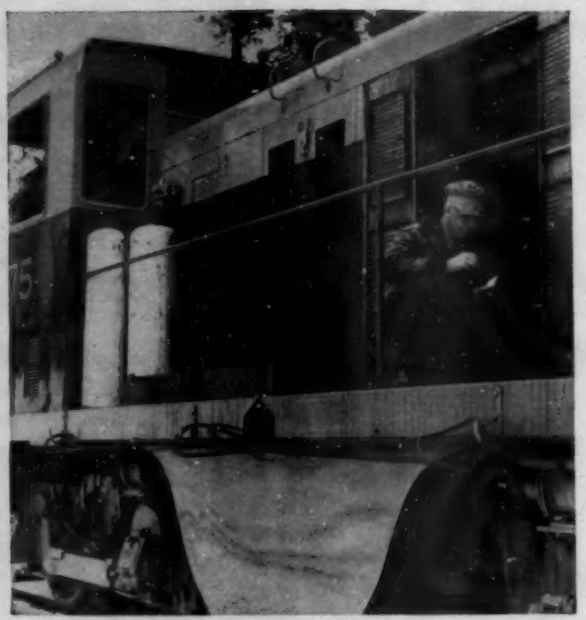
A single drop of used oil from this truck indicates true condition of the vehicle's oil . . . and tells a lot about the engine's operation.



Daily oil checks assure maximum lubrication efficiency in this diesel locomotive.

Now—they're testing used oil in minutes

THE NEED for a fast, accurate and practical method for determining the condition of used oil has long been one of the more serious problems confronting fleet operators. It's obviously wasteful to discard still-good oil, but operating a vehicle with contaminated oil could lead to costly engine damage. This was an unsolvable condition which maintenance men had come to accept.

Since no two vehicles, even of the same make and model, are identical in performance or operation, maintenance men were compelled to compromise on oil change "averages" recommended by engine manufacturers. This procedure is uncertain and costly. Fortunately, this operating conflict has been resolved with the introduction of a simple but completely reliable oil check system . . . the Shell ADC Oilprint Analysis.

The ADC Analysis was primarily conceived to determine proper oil change intervals for individual engines. However, it goes much further. It is capable of actually reducing engine maintenance costs by disclosing certain mechanical defects *before* they have caused serious engine damage.

The test procedure is very simple . . . requires little practice to perfect . . . and provides a reliable check of oil from merely two drops of used oil. In minutes, the degree of *A*lkalinity, *D*ispersancy and *C*ontamination can be determined easily.

Here are several typical examples from various areas of the country. They show how fleet operators, employing both diesel and gasoline engines, have successfully and profitably applied the ADC program.

A Kansas City Freight Line

Operating a large fleet of trucks, one Kansas City freight line previously had drained and replaced oil every 3,000 miles. After adopting the ADC Oilprint Analysis, individual test charts showed that, in most cases, drainage would not be necessary at less than 6,000-mile intervals. Even at this doubled interval, engine life was not affected. Further proof was established when these engines were inspected at 87,000 miles and no appreciable wear was found on bearings, pistons, rings or valves.

An Idaho Logging Operation

Oil had previously been drained after a limited number of hours of use on an Idaho company's diesel locomo-

Substantial oil economy is realized in this tractor, because oil is changed only when indicated by the Oilprint.

Taking a quick "fingerprint" of crankcase oil from an interstate carrier.

tives. With the ADC Oilprint Analysis as a guide, the oil-change interval has now been safely increased many-fold. The savings made possible by this on-the-spot test in oil, filter change and labor costs were considerable. Furthermore, leaky head gaskets are frequently discovered before any serious engine trouble develops. Here is another valuable plus for the ADC Oilprint Analysis.

A Washington, D.C., Transit Company

This transit company operates a large fleet of buses with both gasoline and diesel engines in use. With the difference in operating schedules . . . rush hours, short and long hauls, around-the-clock schedules . . . both engine types were believed to require complete oil changes every 2,000 miles. When the ADC program was instituted, the tests showed that oil-drain periods and minor maintenance checks could be safely extended to every 3,000 miles for gasoline engines and 4,000 miles for diesel engines.

Fleet operators, who are concerned with extending the service of crankcase oil and avoiding the risk of using contaminated oil, are invited to sit in while a Shell service engineer demonstrates the time-and-money advantages of an ADC Oilprint Analysis program.

Photo shows an oil-spot test card . . . one phase in the visual life record of a change of oil.

One drop of a special indicator* fluid developed by Shell checks the alkaline reserve in the oil.

*Indicator Fluid U.S. Patent No. 2,770,580

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

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New Publications

(Continued from page 44)

of Freeways in California," by L. L. Funk; "Planning Aerial Photography and Film Processing for Mapping Work," by John H. Wickham, Jr.; "The Engineer's Approach to Electronic Computing Methods," by Joel D. Aron; and "Coordination of Plotting Instruments and Computers in Cross-Sectioning and Calculation of Quantities," by E. S. Preston.

CONCRETE PAVEMENT. Two papers on the designed of reinforced concrete pavement are contained in Technical Bulletin No. 224, published by American Road Builders' Association, World Center Building, Washington 6, D.C., and available on request.

One paper, "Reinforced Concrete Pavement Design Practice in Michigan," is by C. H. Cash of the Michigan state highway department. The other paper is "Economy of Standardization of Reinforcement for Concrete Pavements" by Warren D. Fish, Chief, Construction branch, Bureau of Public Roads, Washington, D.C.

Publication is under auspices of the ARBA Technical Committee on Steel in Pavements.

HANDBOOK OF RIGGING (Second Edition). By W. E. Rossnagel. 344 pages, 6 x 9, illustrated. McGraw-Hill Book Information Service, 327 W. 41st Street, New York 36, N.Y. Price $6.50.

This widely used practical manual of rigging practices and pointers for construction and industrial work has just been published in a fully revised and up-to-date Second Edition.

The book is planned to show how to handle every step in any rigging operation—rigging a swinging scaffold, painting, operating a hoist, or using a hydraulic jack. It includes simple formulas used in calculating the strength of hoisting tackle, beams and posts, etc. It gives such varied helps as data on safe loads on wire rope and chain, effects of defects on the strength of timbers, reference codes, laws, and standards relating to rigging, hoist signals, safety practice and first aid, and many other facts and data useful in all aspects of planning and handling safe, effective rigging.

New Manual on Calcium Chloride Procedures Available

The most complete and comprehensive manual on the handling, storing and applying of calcium chloride has been published by the Calcium Chloride Institute (Manual HM-1). The text describes how to store in bags or bulk, inside or outside, handling methods and preparation of facilities for short and long term storage in all seasons.

The manual also contains directives for preparing calcium chloride solutions by dissolving the Type 1 flake or Type 2 concentrated calcium chloride for liquid applications. A section is devoted to winter maintenance.

Single free copies are available on request to the Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

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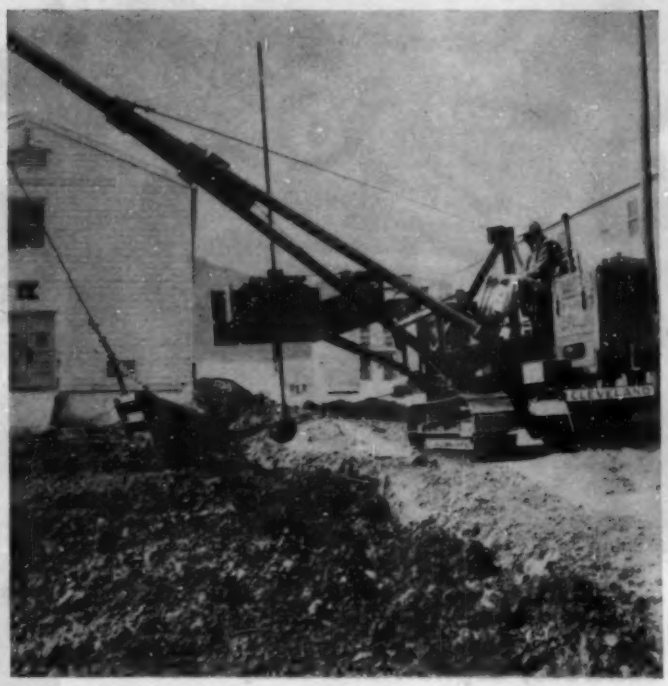

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Hard earth, broken concrete and asphalt are tough materials to dig, but the machine's superior pry-out action resulted in full bucket loads. The main problem was keeping enough trucks under the bucket. The No. 977 was loading a truck in less than 2 minutes, and it maintained a good level grade as it dug. Vogel Construction Corp. also found the No. 977 good at skimming asphalt off of old pavement.

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ROADS AND STREETS

The Case of the Terrific Tandems

By Kenneth F. Park

Earthmoving Consultant, San Leandro, California

How would you like to set a world record for yardage moved per day per scraper? This analysis tells how one contractor accomplished this feat recently, under ordinarily good conditions such as the average contractor often finds on his jobs. A discussion of today's problems in scraper application and use of "Thrifty Tractor Twosome" loading.

MORE on the above subject later—but for the moment, what kind of equipment are you going to use on that big earth-moving job? After all, there is nothing any better than the scraper. But what size? What to load it with?

Well, the larger the scraper the better—provided it is a properly designed and efficient rig. So what is well designed? And what is efficiency in such a unit?

Good design means light machine weights—with strength commensurate to work strains—ample horsepower—sufficient tire capacities—and good appearance. Efficiency is a matter of putting forth performances in keeping with good design. Quick, easy loading. Light draft. Big loads. Trouble-free operation. Ease of servicing and repair.

What size then? And here is the crux of the successful use of scrapers today! The answer? A size commensurate with the power that will load it—or better yet—and more properly—a big scraper, or scrapers, push loaded with power commensurate with the chosen size.

And what is this affinity? Loading power—*effective* loading power. Amounting in pounds pull—as a minimum—to the net weight of the load desired in the scraper. Note the interdependence of weight and volume? An almost unrecognized mutuality! Rarely does it pay to try to obtain more pounds of scraper load than there are effective pounds of pull to load it. Too many contractors today are trying to obtain 60,000, 70,000, 80,000 lb. loads in today's larger scrapers with the same push power they have used in the past in obtaining 35,000 or 40,000 lb. They are asking a boy to do a man's job. And how can a power source suddenly increase its normal output by 200 percent? It cannot, of course—nor should it be expected to.

Scrapers are just as efficient as in the past; much better in fact. Tractors are better than ever. They just have to be properly coupled in respect to capacity on one hand and loading power on the other.

One of the author's oft repeated axioms is (re economical loading) "a pound of dirt from a pound of drawbar, in a minute." Even while we have fractional improvements in this concept it remains singularly true today. A subsequent article will deal with the calculations of loading and performance based substantially upon this regulative principle.

Barring a few notable exceptions where deviations followed no pattern, there has always been a see-saw of developments between scrapers and tractors in which each took its alternate turn in overpowering the other. First, too large scrapers, not enough load power in tractors. Then large enough tractors and not enough scraper size. A few months ago adequately sized tractors were introduced which momentarily caught up with scraper sizes and a proper balance existed.

Already, however, under oft recurring conditions, scrapers are too large for that greater load power, even before many present owners of big scraper units have become aware of the economic needs for increased loading ability. Probably, then, leaving the less aware continually in a state of being underpowered for loading—and consequently bringing up the tail end of the parade.

If there is any one deplorable condition existing today in this field of activity, it is that too many too big scrapers are being push loaded by too many too small tractors.

One of the more and more apparent impressions developing in scraper use is that, where equipment is suitably matched, and performances fall off—or costs unexplainably rise—the inevitable explanation, somewhere in the operation, is *lack of power.* This becomes most apparent in the loading operation where more than considerable performance fluctuations originate and where power loss is felt most directly.

Proper Balance

Years ago we had a 59 cubic yard, heaped capacity scraper (delegated long since to oblivion) into which we push loaded, by devious and long, drawn-out processes, loads of earth weighing 135,000 lb. There was no chance for such Gargantuan units to justify their existence. They were too unwieldy, impossible to load economically and had several other bad features. Today there are rubber-tired tractor-scraper combinations being offered in sizes up to 40 yards heap. For the moment, this size is judged too large for all-around economical use. The most properly balanced units—as to horsepower, speeds, loading potentials and carrying volume seem to range between 30 and 35 cubic yards heaped capacity.

Loading Conditions

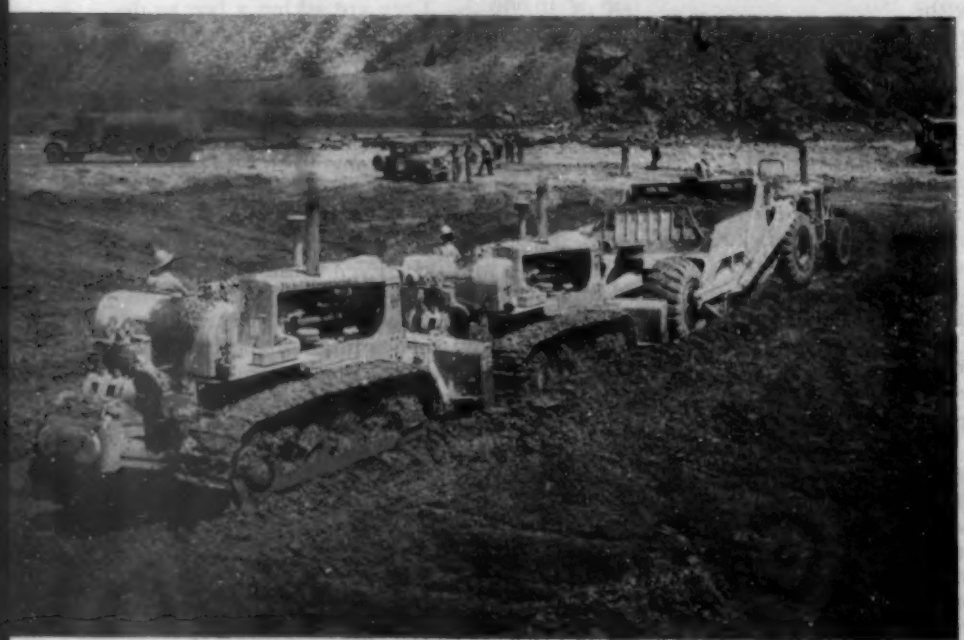
Now, in really good conditions, the largest pusher tractors presently available—the products of three manufacturers, two crawlers and one rubber-tired—are capable of loading such scrapers effectively and economically. Given worse than average loading conditions and/or heavy, dead material, there just is not enough power, even in these modern, largest tractors, if used singly, to load the big scrapers properly. There is no avoiding such inevitability. If they *can* load the big scrapers—economically, mind you—the conditions are good. If the conditions are poor they *cannot.* Which conditions dominate your use of such machinery?

Extensive studies on all lengths of haul show that a one-minute loading period—or slightly less—with a single tractor pushing a suitable number of scrapers, creates the cheapest earth moving for that combination. (Probably tied up with today's hauling speeds, however.) Any time less than a minute (single pushers) is not producing enough yardage. Any more than a minute produces too little yardage in relation to involved costs. The greatest loss of economy lies in spending as much time beyond one minute in obtaining two or three yards as was spent in the first minute in obtaining from 15 to 18 yards, depending upon the size of the pusher. When the situation arises in which excessive loading time indicates inefficiency—or too small loads are obtained in reasonable periods of time—or bigger loads are needed to improve production and costs—what to do?

An excellent solution lies in *Tandem Pushing*—one tractor back of another—both back of the scraper. Inefficient you say? Clumsy? Costly? Well, it is none of these. Already an accepted and proven system, this doubling of loading power is creating new concepts in work situations which but a few short months ago were worrysome and costly.

Greater Efficiency

Tandem pushers have been shown to develop greater than normal efficiency. A recent demonstration—as the maximum among many—produced 87 heaped loads in a one hour period. (One of these same pushers, loading alone, created 48 loads in an hour.) "Peewee" Russel, one of the operators, is a proud and happy man today be-



This is a typical condition in which large scrapers (33 cu. yd. heaped capacity) capable of high rates of production cannot be loaded suitably with one pusher tractor. In worse conditions than these the owners resorted to three pushers on occasions.

In a lob-lollie of sand, gravel, boulders and water—weighing about 3400 lb. to the cu. yd., where no swell occurred—traction was poor, the material was loaded with difficulty. Each bowl-level load weighed about 88,000 lb. No single tractor could posibly attain that volume.

Further, two tractors in such a pit with really adverse conditions often push out a scraper too mired down to travel. One pusher of any known power in such conditions would be hopelessly inadequate.

Note the inside mounted bulldozers and pusher blocks on the back of the tractors.

Here, conditions are nearly borderline. Good, active, easily loaded material. Excellent traction. Nevertheless, twin pushing produced 67 percent more yardage per hour at a cost cheaper by 25 percent than did single pushers.

cause of that. Proud and happy because on that occasion, except for one of his fellow workers of that day, he handled more pay yardage in a scraper hour than any other man in the history of the business. More than an incredible 600 cubic yards an hour—and these figures can be testified to by many observers. Think of it—over 1700 cubic yards excavated, hauled and spread with one small and two large scrapers in an hour.

This almost unbelievably high rate of production was produced by one scraper-tractor combination of 25 cu. yd. heaped capacity and two 33 cu. yd. machines. These were push loaded with two 320 horsepower, direct-drive, track tractors. One operator was well experienced, three were occasional workers in this activity, and one had but a matter of hours on such machines.

Loads Carefully Timed

Well over a thousand loads were handled—over four hundred of which were carefully timed. After a comparatively slow start with 57 loads an hour, synchronization and efficiencies increased until they obtained their maximum 87. The average was 76. Individual load quantities, conservatively established at 16 and 21 bank yards, established an average of nearly 1500 excavation yards an hour. The average loading time was 0.411 minute or 24.7 seconds. The average pusher cycle, or in other words the lapsed time between each loaded scraper leaving the pit, was 0.790 minute or 47 seconds. The average transfer time—the delay between a pusher leaving a loaded scraper and its contact with the next was 0.379 minute or 23 seconds. The round trip travel was 1200 ft. over level terrain. The cycle, or round-trip time, for each scraper averaged 2.37 minutes or 2 minutes and 22 seconds. The material was a lomey clay weighing 3,000 lb. in place.

This is too fine a performance to expect on continuous operations, but it is *not* too much to expect from 75 percent to 80 percent in good conditions and a minimum of 50 loads in fair conditions.

This last kind of performance has been recorded in many instances. Several factors contributed to the amazing figures just enumerated. They will be:

1. *The tremendous amount of loading power.*

Some 100,000 *effective* pounds in the combined package, out of a potential 142,000 lb., forced great loads into the scrapers in record time—never allowing inflowing earth to stop moving. Single pusher tractors took over a minute to obtain loads of similar—though judged lighter—appearance. The relative cost was several cents in favor of the tandem.

2. *Short transfer time.*

Meaning that period between stopping pushing one scraper and starting to push another. In single pusher work this figure can run up to more than a minute. By alternating at the back of scrapers, as tandems do, the first is obtaining the easily loaded dirt while the second is in transit from the previous scraper. The second then adds it power at the back of the first to top out the load at the point where incoming earth is so hard to obtain. The second then moves to the back of another scraper and number one helps its scraper out of the pit—and so on, alternating ad infinitum.

3. *Improved clearances, maneuverability and balance for the pusher by the use of track-wide, inside-mounted bulldozers.*

These units have great rubber blocks mounted within the bowl structure to absorb contact shocks, reduce potential damage to gears and body members on both pusher and pushed. Pusher blocks are mounted on the backs of each crawler tractor. These also containing the same rubber blocks to further reduce shock and damage as well as minimizing jar to operators—and establish quicker and more powerful loading contacts with each other in the actual loading process.

Anyone Can Do It

There is no magic in obtaining the kind of results described in this text. Anyone can do it. They were achieved by ordinary, run-of-the-mill people. In good conditions, true, and with the best of equipment—except for the inclusion of the smaller scraper in the group (which was used for the purpose of contrast even though it reduced the over-all performance by 150 yards an hour). Any results less than these could have been anticipated by making allowances for any restricting influences before tests were ever allowed to start. All you have to know is how to analyze the situation confronting you—what to do about it—and your results should never be much short of those calculated.

The whole things is calculable, so there is little excuse for lack of

results commensurate with the ease or difficulty of the situation. Actually, given all factors—such as haul profile, grades, elevations, material classification and weight, scraper size, horsepower, the kind and vintage of the pusher tractor, gear ratios, tare and gross weights—and there is little reason for missing performance rates. These calculations should guide the contractor in the selection and purchase of new machinery as well as to tell him what kind of results and costs to expect from it—as well as from all competitive machines.

The writer is continually meeting owners who say "We never obtain the kind of performances you say the machinery is capable of turning out." Well, plenty of owners do, and it is generally from such sources that our findings are substantiated. Ideas presenting new or radically advanced methods are then—of all times—most critically examined and tested, so they have to be good—and correct.

We know that several contractors during tandem pusher tests would have preferred to have said, "You can't do that. It's impossible. There ain't no such animal." Observed with open mind, however, several great operators are now applying the method where proper.

Plutarch, centuries ago, remarked, "Knowledge of things is lost to us by incredulity" and many skeptics have lost the benefits of tandem pushing—only to succumb to its unbelievably efficient and productive application.

Advantages of Tandem

Someone may rightfully say, "In the case of your 600 ft. haul and pusher tests—why not put two pushers in the pit singly and obtain 96 loads per hour?" The answer to this one is that while *three* scrapers and two tandem pushers fitted perfectly on that haul length, it would take *five* scrapers for two single pushers. The loads would be somewhat smaller and the overall cost about a cent and half per yard higher—to say nothing of the greater investment.

Actually, the advantages of tandem over single pushing are least apparent in good operating conditions such as these. As material gets heavier and tougher, and as job conditions get worse, the spread in production figures and cost figures between tandem and single pushing become wider and wider until (for the most adverse conditions, where draglines would normally be considered) one tractor simply can't do the job at all, and tandem tractors will not only *do* the job, but at cost figures substantially below that of any other known method.

The reason for these relative performances lies in the action that earth takes during scraper loading—easy to obtain at first, and becoming increasingly harder to the point of ultimate refusal.

Where Tandem Unnecessary

Obviously there are places where tandem pushing is unfitted—or let's say, unnecessary. Intensive field and job tests and analyses have advanced loading and earth handling techniques, however, to a point where suitable applications can be established before a job starts. Job and machine studies, while calculated by many of our new methods, follow with remarkable closeness the basic performance principles established by the author years ago during the early development of the tractor-scraper method of earth handling.

More and more, such calculations show that the economies of scraper operations center themselves in the borrow pit. Most generally in the loading and most specifically in the pusher power used for that purpose. The pusher—like the shovel in its day—is the most important tool in today's scraper work. Given an excavating, hauling and filling job in earth, the entire rate of production depends upon the amount that can be loaded out. No amount of efficiency in hauling and placing the material will "up" the quantity leaving the pit.

SO, build pusher performances up, fit scrapers to the added rate of digging, and costs will go down.

Look in the future, then, to tandem pushing for this big improvement and keep in mind that you can't haul any more than you can load.

Reprints of Mr. Park's Analysis Are Available For Your Staff

This article can be removed by cutting along the dotted line. Extra free copies are available on request on your company letterhead. Quantities of ten or more can be had at a nominal cost. Address The Editor, Roads and Streets, 22 W. Maple St., Chicago 10, Ill.

Highway Employees Resign Following Down-Grading

The Colorado department of highways has suffered a severe blow with the resignation of 44 employees. This exodus was precipitated by the pubication of a civil service pay raise and regrading plan in the state which downgraded 100 of the department's permanent classified staff, totaling 1732 people.

The existing grade was restored to 300 maintenance patrolmen following objections by chief engineer Mark U. Watrous and John F. DeVivier, his personnel director.

The resignations brought to 78 the total drop-outs for the year since January, 49 of which have been in engineering classifications. During a recent month, the department was able to hire only 10 new people in engineering classifications and two in maintenance.

Pay raises were voted for various classifications by the recent session of the state general assembly, and June paychecks included raises for many employees which partly offset the downgrading. However, the situation has not been cleared up at this writing, and the department, according to chief engineer Watrous, is "faced with a critical situation in view of the present expanded road construction program." A classification plan is being sought in cooperation with the Civil Service Commission that will help attract workers by salaries competitive with private industry and other public agencies.

Extend Oklahoma Turnpike

Late in June, the extension eastward from Tulsa of the Oklahoma Turnpike was dedicated, adding 88 miles to this toll road which now extends from the Missouri state line to Oklahoma City.

Turnpike officials point out that this creates a continuous 2,107 mile stretch of 4-lane highway from Maine to central Oklahoma.

Engineering Under a Mace

(Author's name withheld.)

A former state highway department employee tells what it was like to work under a political spoils system. This statement is presented as our editorial for the month. It speaks for itself. Editor

Does talk about highway departments and politics really mean something? Can political interests actually wreck a department, or is the claim a phony circulated by opposition parties?

It's hard for me to believe now, but not long ago, I used to sit down twice a year with my bank balance and try to determine how little I could get away with paying the state and still keep my draftsman job. I didn't have enough money to fork over the amount I was told to give to the party, but I had enough pull—or my supervisors thought I had—to get away with a $20 political contribution instead of the officially required $58: 2% of my yearly salary.

I won't name the state I worked for because for every shady state employee, you'll find dozens of uncorruptible men; men I was proud to work with. The sad problem of governmental corruption begins with political conniving at the top, but eventually every man in the table of organization gets stung. A certain group can always be found to help with the stinging.

Political pressure is a subject most engineers hesitate to tackle, but it was political pressure that encouraged me to seek employment with a private firm. When I was ordered to subvert my interest in engineering to an interest in local and state politics, I faced two alternatives: I could stay where I was and become a minor politician, or I could resign in favor of politics-free employment.

Where I worked, pressures were applied to the chief engineer, to junior draftsmen, rod men and to every blessed soul in between. In descending order of irritation, these political obligations were:

- Mandatory payment of "voluntary" contributions for campaign expenses.
- Almost mandatory attendance at bi-weekly meetings of a political club run mainly by state employees. The highway department district engineer was its president.
- Compulsory purchases of assorted political rally tickets.
- Assignments of batches of political posters to distribute.
- Signing of political petitions circulated through the office.
- Checking on the voting registration of friends and relatives.
- Chauffering on election days.

The matter of "voluntary" contributions was handled by roster and those who attempted to renege were interviewed in private by their department heads. I had one such interview with the district engineer in the course of which I was bluntly asked whether or not I liked my job.

Can I pin this business down to definite figures? I can. I was personally told by my apologetic plans engineer (who was placed squarely and unfairly in the middle: he liked his men, but he had just 3 more years to qualify for his pension) that the going rates for annual voluntary contributions were 1% of a year's salary if I made up to $1999; 2% of $2000 to $2999; and 3% of a year's salary above $3000. This occurred in 1950, in 1951 and again in 1952—the year I left. The party in power was subsequently ousted in a state election. On a recent visit to my former place of employment, I was told quietly that things are "much worse". The gimmick now seems to be obligatory purchase of high priced political dinner tickets.

Concerning the other irritants involved in working for that particular state and the former administration: I tacked "Vote for . . ." posters on phone poles and trees; I played cat-and-mouse with the engineer in the office who tallied attendance at the political club meetings; I signed a number of aspiring candidates' official petitions and saw men around me sign not only their own names but those of relatives as well.

Understand that I am not opposed to campaign donations, political clubs, posters and fund raising activities as such, but when these activities become an integral and even dominant part of highway engineering, I must rebel.

A state highway department used as a push rod of a political machine is operating under a tremendous handicap. When pressure is applied at the top, all beneath feel the impact. Any engineering employee put upon by his superiors to carry out political undertakings as a requirement for his present and future security is, in my opinion, 100% justified in severing his relations with those superiors.

Briefly Noted . . .

Prediction: The time will come when motorists and truckers on Interstate system travel will be stopped at regular intervals and the condition of their vehicles, particularly their tires, checked for safety. Also this check will systematically include the drivers, themselves, in the realization that the average state driver's license does not mean too much today.

A systematic check on tire conditions on the Pennsylvania Turnpike is credited as one of the reasons why the traffic fatality record for this turnpike dropped drastically during the first six months of 1957. A similar check has been made at various times on the Ohio Turnpike. The time is rapidly passing when state governments can continue to allow unsafe drivers with unsafe cars to mingle freely and without control among motorists and truckers who are trying at least to keep alive and keep from killing others.

Air Base Paving Job . . . Seven Aggregate

● **Finished concrete aggregates were stockpiled from loads weighed in at left of picture, and belted to the novel shuttle conveyor glimpsed at right.**

Details of a plant, assembled from available components, which produced over 650,000 cubic yards of materials for base course and paving requirements.

By H. K. Glidden

Contributing Editor to Roads and Streets

A PAVING program for an air base must be backed by high-volume aggregate production. An example of special plant facilities designed for such a job was that used by Curtis Construction Co. at Fairchild Air Force Base near Spokane, Washington.

This SAC base was enlarged and modernized in 1956 under a prime contract held by Morrison-Knudsen Company, Inc. As one of several subcontractors, Curtis Construction Co. produced aggregate for 270,000 cu. yd. of subbase, 145,000 cu. yd. of base course, 104,600 tons of asphaltic concrete and 144,500 cu. yd. of portland cement concrete.

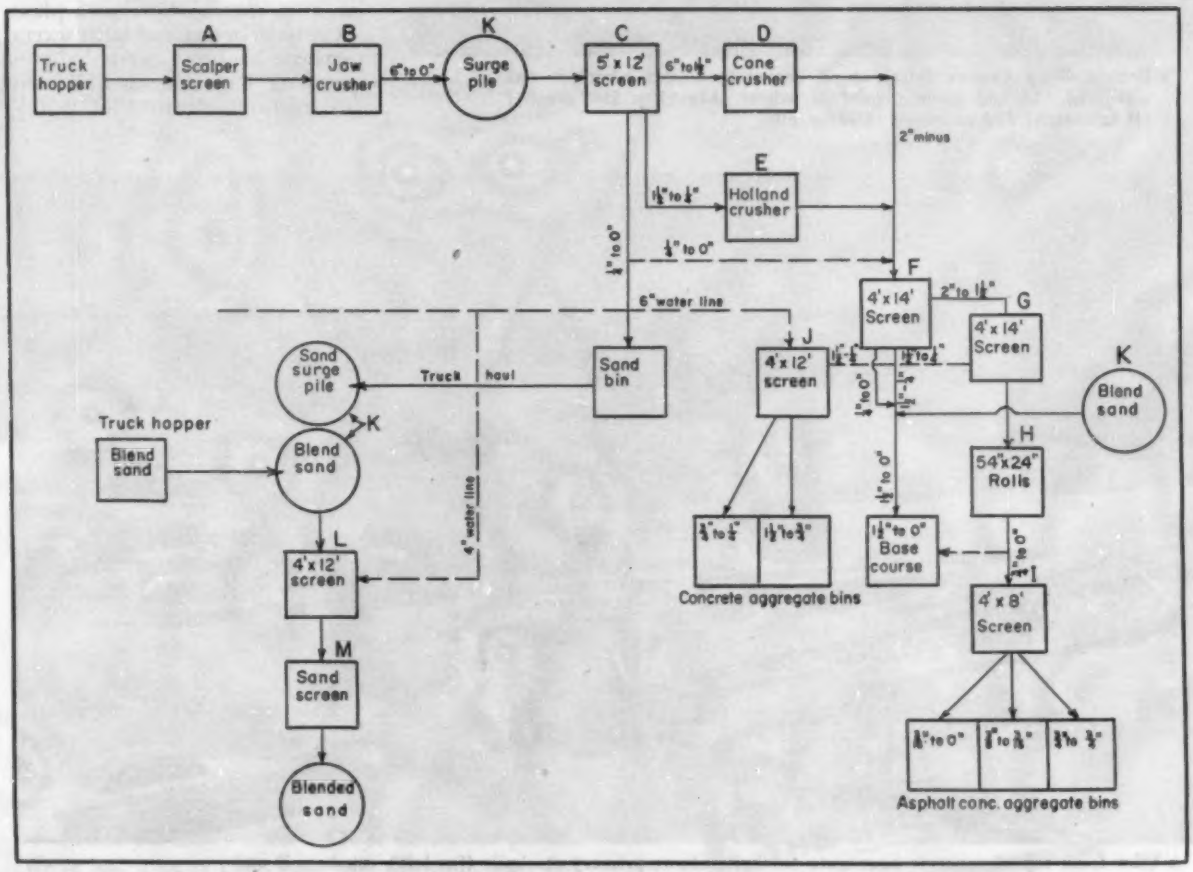
Curtis carried out all aggregate production at a site about one mile from the principal paving areas and located on railroad trackage. A deep glacial gravel deposit provided a variety of aggregate sizes. One area provided coarse sand suitable for subbase which could be shovel-loaded and trucked directly to the paving area.

The crushed aggregate and concrete sand were manufactured in a convenient area near the trackage, allowing easy delivery to the asphalt plant and concrete batch bins. Aggregate suitable for crushing came from an open pit with one-half mile haul. The following details are related to the plant layout sketch published on these pages. This material was loaded by shovel into bottom-dumps, delivered to a hopper and fed by belt to Cedarapids scalper screen (A) and to a 20 x 36 Universal jaw crusher (B). The primary crushed product then went to a large surge pile designed to provide flexibility in meeting the variable day-by-day demand for various finished products.

The complexity of the crushing process after leaving the storage pile is illustrated by the fact that seven gradations of aggregate were produced simultaneously. Combined production typically

(Second of two articles on this project. See "Concrete By Night, Asphalt By Day" in the May, 1957 issue of Roads and Streets.)

Gradations, 450 Tons Per Hour



● **Scheme for producing aggregates from glacial gravel and blending sand.**

averaged 450 tons per hour with maximum capacity near 500 tons.

From the storage pile the aggregate was conveyed to a 5 x 12 Simplicity screen (C) which separated it into 1½ in. plus, 1½ in. minus. The fractions then passed through separate crushers including a Symons 4½ ft. cone (D), a Holland impact breaker (E) and the flows re-combined and passed over a 4 x 14 Symons screen (F).

The sand fraction was belted to a bin for truck haul to a sand processing line (beginning at K).

Specifications required a gravel with two fractured faces. The impact breaker was selected with this in mind.

● **Gravel for crushed aggregate being loaded by a Manitowoc 4-yd. shovel into Cat DW15 bottom-dump wagons.**

• Bottom-dump wagons delivered pit gravel to hopper where it was screamed (A) and given primary crushing through a jaw crusher (B in sketch) and conveyed to surge pile.

retained on the fine sand screen. This required the importation of blend sand to bring the base course aggregate within specifications.

All gradations of aggregate were binned at the crusher site. The base course aggregate was hauled directly from the bin to the job. The three gradations of asphaltic concrete aggregate were trucked to stockpiles over a tunnel leading to the hot plant. The concrete aggregate was hauled to a stockpile adjacent to the concrete batch plant.

Curtis designed and built several aggregate hauling rigs especially for spreading base course. Each unit (see picture) consisted of two V-shaped bins in tandem on a single chassis with full-width bottom dump outlets. The combined hauling capacity per unit was 24 cu. yd. level, 27 cu. yd. heaped. The main advantage of these haulers was the uniform spreading of aggregate although they worked well for other hauling jobs such as emptying into conveyor hoppers.

Curtis also used these rigs to haul the two sizes of concrete aggregate to a stockpile conveyor for a novel and efficient arrangement designed to facilitate very large stockpiling and re-handling. This system is pictured and sketched herewith.

• View from top of concrete aggregate stockpile shows primary stockpile (far left), crushers D and E (at center), and specially designed aggregate truck (foreground) unloading finished product to conveyor leading to concrete aggregate stockpile.

Coming back to the above stone blending screen (F), this screen removed excess fines and separated the aggregate into three gradations. One fraction, 1½ in. to ¼ in., for base course, was conveyed directly to a storage bin where it was combined with blend sand (K) as necessary to correct the gradation.

Some of the 1½ in. minus was diverted for concrete aggregate. A 4 x 12 Simplicity screen (J) further divided it into 1½ to ¾., and¾ in. minus. After washing; these two aggregates were conveyed to a 2-compartment storage bin.

A third separation of material was for asphaltic concrete. A 4 x 14 Simplicity screen (G) and 54 x 24 Pioneer roll crusher reduced the stone, which was then put through a 4 x 8 Simplicity screen and divided into three sizes, ¾ to ½ in., ½ to ¼ in. and ¼ in. minus.

The aggregate in the pit contained a high percentage of fines. This necessitated wasting about 25 percent of the material going through the primary crusher. Waste sand was conveyed to an abandoned gravel pit and bulldozed to ground level. This wasting, however, produced a deficiency of material passing the 30 screen and

The No. 12's part in a good team job

The Caterpillar No. 12 Motor Grader is a key piece of equipment in efficient earthmoving. By leveling fill and building and maintaining haul roads, the No. 12 helps tractor-scraper rigs handle bigger loads in faster time.

The job pictured is at Fogelsville, Pa., where W. E. Johnson had a 231,000-yard contract, relocating nearly a mile of U. S. 22. Smooth haul roads maintained by the Cat* No. 12 Motor Grader allowed three Cat DW21s pulling No. 470 Scrapers to move 4,000-6,000 yards of dirt per day.

In Mr. Johnson's words: "We're Caterpillar people. We've had a lot of experience with Cat equipment and we know when we start a job we can count on finishing it with a minimum of down time."

Construction men everywhere regard the No. 12 Motor Grader as the standard in its field. It is ruggedly built for heavy, round-the-clock work. And its balanced design and dependable four-cycle Cat Engine make it a big producer. Operators like the fast, positive controls, easy blade positioning and unobstructed visibility from the seat. Most tire down time is eliminated by tubeless tires. The exclusive oil clutch operates for many hundreds of hours without adjustment. And in-cab starting, electric or gasoline, is standard.

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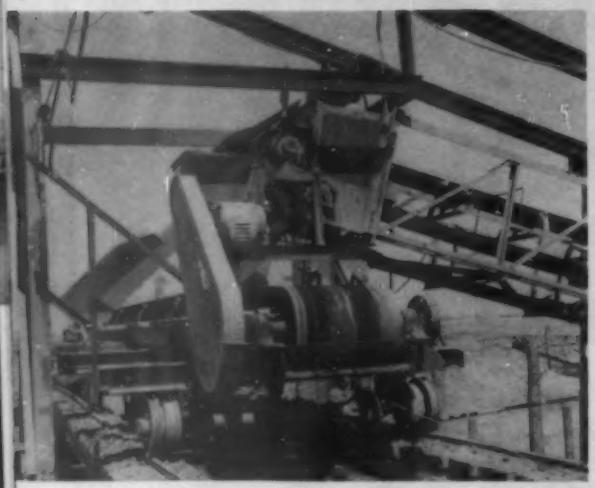
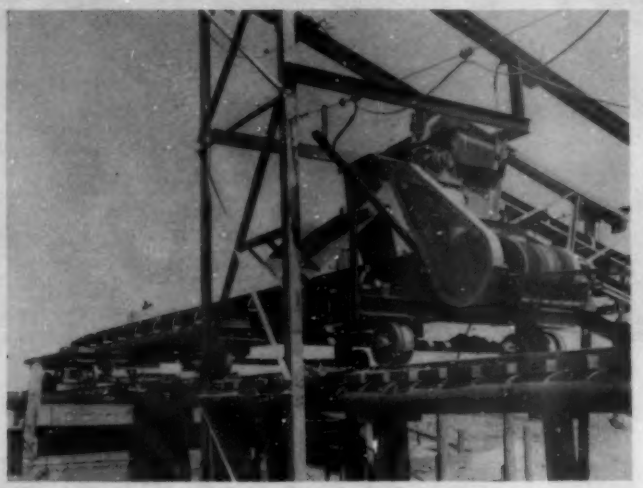
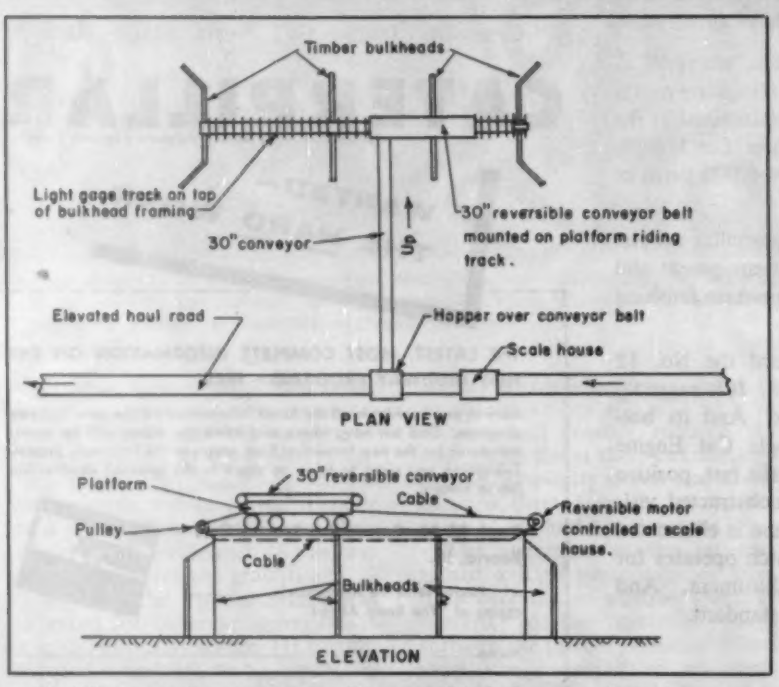
• Lateral view of the special rail-mounted, reversible belt used to stockpile various sizes of finished concrete aggregate.

• (Below): Two views showing how the primary conveyor to the produced concrete aggregate stockpile (at right) discharged onto a secondary conveyor which could be reversed or moved along a track. The latter belt was able to deliver aggregate in any one of three stockpile compartments.







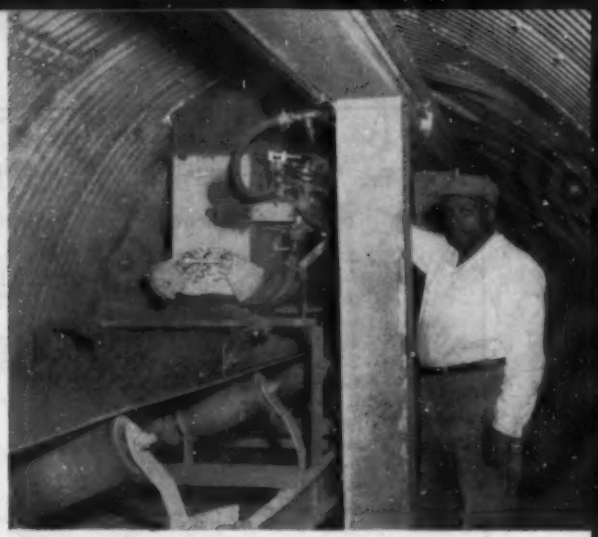
• Shuttling secondary conveyor with reversible belt was a feature of the storage and rehandlin goperation for the finished concrete aggregate. One end or another of the belt could drop material into any desired pile compartment.

After being weighed on L. R. Murphy scales, one stone size or the other was emptied onto a primary 30-in. conveyor leading to the center of the stockpile area. A secondary conveyor, which could be both reversed in belting direction and moved laterally for its full length, ran at right angles to the primary conveyor. A man in the scale house controlled both conveyors. By controlling direction of travel and position of this top conveyor, he could put either aggregate size into any bin he selected.

The heart of the concrete aggregate stockpile was a tunnel consisting of 220 lin. ft. of 96-in. corrugated metal pipe with 11 gates feeding onto a 30-in. conveyor belt. Ground water, quite a problem, was taken care of by a Thor air-driven sump pump.

Heavy plank separator walls above ground divided the stockpile into four compartments, two for 1½ to ¾ in. aggregate, one for ¾-in. minus, one for sand. Nine of the 11 aggregate openings were Crescent type AHL magnetic valves remotely controlled by the batch plant operator. A watchman patrolled the

● **Finished concrete aggregates in three sizes were stockpiled over a buried 96-in. corrugated pipe. Top of air-driven Thor sump-pump glimpsed in left foreground.**



● **Batch plant operator controlled flow of aggregate onto tunnel conveyor belt through nine Crescent type AHL magnetic valves. Watchman shown operating hand valves for stopping belt in emergency.**

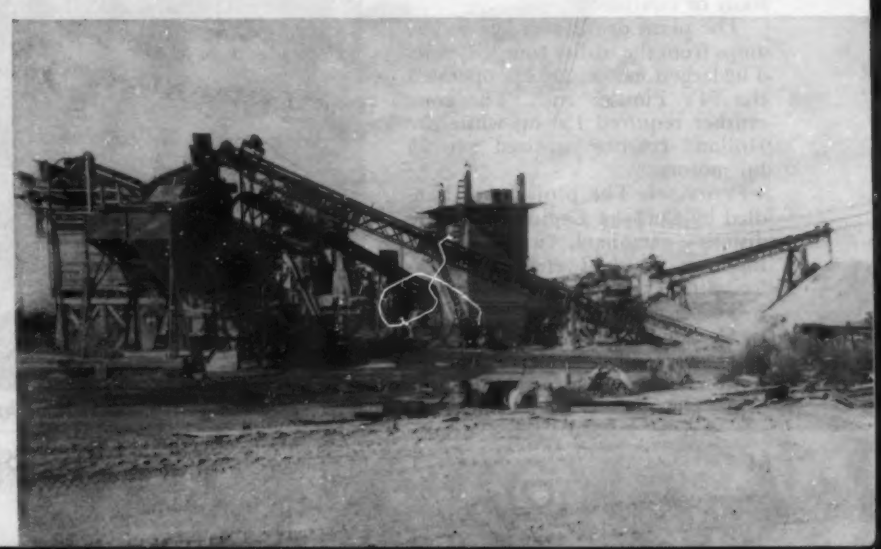
● **Sand plant (L and M) resulted from specifications requiring blending, washing, and 72-hour drying of concrete sand.**

tunnel continually and could shut off any valve or operate the two hand valves as required. The tunnel conveyor emptied on a 30-in. belt leading to Morrison-Knudsen's twin batch plant.

Concrete sand presented a problem in that it could not be completely produced from local gravel deposits. Specification sand required importing and stockpiling a fine sand which was blended with ¼ in. minus sand produced in the crushing operation. Each sand component was stockpiled over a conveyor tunnel (see K in sketch), and delivered in about equal proportions to a 4 x 12 Pioneer screen (L) and a 48″ x 30′ Wemco sand screw (M). The Pioneer screen simultaneously removed oversize and washed the balance. Modification of the screen was made to provide for washing consisted of four 2-in. perforated pipes, each welded into a 3-in. manifold on both ends. The pipes were placed crosswise of the screen and water under high pressure sprayed onto the screen. Sand passing over this screen was processed through a Wemco model SH classifier, which delivered the finished sand to another conveyor.

Specifications required that concrete sand be dried at least 72 hours after being washed. To comply

(Continued on page 107)



● **Close-up of primary roll crusher (D). Bins (on left), control tower (center), waste sand stockpile (right).**

Aggregate Plant, Fairchild Air Force Base

Key	Type of Equipment	Size	Manufacturer
A	Scalper Screen	3′ x 8′	Cedar Rapids
B	Jaw Crusher	20 x 36	Universal
C	Screen	5′ x 12′	Simplicity
D	Cone Crusher	4¼′	Symons
E	Holland Impact Crusher	30″ x 30″	New Holland
F	Screen	4′ x 14′	Symons
G	Screen	4′ x 14′	Symons
H	Roll Crusher	54″ x 24″	Pioneer
I	Screen	4′ x 8′	Simplicity
J	Screen	4′ x 12′	Simplicity
K	Syntron Feeders (4)		
L	Screen	4′ x 12′	Pioneer
M	Sand Screw	48″ x 30′	Wemco

Other Equipment Used at Plant

1	Shovel	3 Yd.	Manitowoc 3000
4	Tractors & Wagons	15 Yd.	Caterpillar DW 15
1	Tractor & Dozer	D8	Caterpillar

with this requirement, Curtis used a swinging conveyor for final stockpiling. This unit could be rotated through almost 180 degrees, allowing it to selectively stockpile sand over any one of the sand openings into the conveyor tunnel to the batch plant. It could also deliver sand to a bin for truck loading.

An interesting feature of the crushing plant was a centrally-located control tower which enabled the foreman or the operator to see directly into most of the crushers, conveyors and screens from the control stand. They thus could spot possible trouble before it could become serious. Since the plant was all-electric, the grouping of controls and gauges in the control tower allowed quick action in starting or stopping any piece of equipment independently. The lower part of the tower provided a handy place for storage of repair parts and other frequently used tools or equipment.

The plant drew from 700 to 900 amps from the utility company line. The largest motor, 200 hp, operated the 54V Pioneer rolls. The cone crusher required 150 hp while the Holland crusher required two 75 hp motors.

• *Personnel.* The project was handled by Corps of Engineers, Seattle district personnel, with Gerald Bletcher, resident engineer. Rexford Stuart was superintendent and Bill Sipes crusher foreman for Curtis Construction Company. Darwin Lind was project manager for Morrison-Knudsen Company, Inc., the prime contractor.

Job & Equipment Ideas

Wooden Template Speeds Pile Driving on Sewer Project

A technique for driving steel sheet piling quickly without the use of sheeting guides or leads greatly accelerated this phase of a sewer project just completed by Speedway Contracting Co., Milwaukee.

The contractor devised a portable wooden template 18 ft. long and 7 ft. wide which was placed on the ground along the driving line. Several long 10-in. timbers were used for the two 18-ft. sides, and a number of 7-ft. long timbers of the same width were used as end pieces and cross braces. Iron stakes driven along the inside of the form anchored it to prevent shifting during driving.

With the template marking the exact location of the sheeting, the crew was able to drive the piling at a steady pace, using sheeting rented from L. B. Foster Co.

One reason for the template technique was the speed required on the job, which involved the laying of 2200 ft. of 54-in. concrete pipe in a new residential area on Milwaukee's northwest side. Originally planned as a tunnel job, the rapid growth of the area made it necessary to speed up the project. The open cut method was decided upon as being faster.

Continue Streamlining of New York Public Works Dept.

Streamlining and strengthening of the New York State Department of Public Works, begun in recent months, continues with the formation of a Bureau of Budgetary and Administrative Planning. A career man in the budgetary field will head the bureau.

The new Bureau will direct and coordinate such matters as preparation of annual budget requests, capital construction estimates and long-range projections; special studies of highway and other capital financial planning. Also it will develop program costs, performance standards and other budget criteria, improve systems for reporting financial information; and prepare summaries and recommendations for the top executives of the department.

• Sheeting was guided into position by the simple framing shown.

THE CASE OF

THE OWNER WHO THOUGHT AHEAD

ART, THIS CAT* CARE SCHOOL SHOULD PAY OFF WHEN WE START ROLLING NEXT SPRING!

CAT

-AND SPEAKING OF SPRING, I'M GOING TO NEED SOME SERVICE WORK ON MY MACHINES TO BE SURE THEY'RE READY.

NOW'S THE TIME TO THINK OF THAT, TOM!

SUPPOSE WE MAKE UP A SCHEDULE FOR WINTER SERVICING OF YOUR EQUIPMENT. THAT WAY WE'LL GET THE MACHINES BACK ON THE JOB FASTER-MAKING MONEY FOR YOU.

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CATERPILLAR

SWELL! LET'S START WITH MY D6 ON MONDAY. WE'LL BRING IN THE OTHER EQUIPMENT ON A SCHEDULE AFTER THAT.

MONDAY'S FINE! NOW, LET'S MAKE A LIST OF JUST WHAT NEEDS TO BE DONE...

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THERE'S A "Euc" SCRAPER MATCHED

3 TYPES

Euclid offers you the most complete line of self-powered scrapers in the industry—and they're all job-proved to give you more work-ability and low cost yardage. No matter what your job may be—from small clean-up or grading work to big yardage projects—there's a size and type that meets your requirements.

SIX-WHEEL SCRAPERS

These models provide maximum stability for long, high speed hauls. They have capacities of 12, 18 and 24 yds. struck . . . are powered by engines of 200 to 335 h.p. and haul heaped loads of 16, 25 and 32 yds. at speeds up to 30 mph.

OVER-HUNG ENGINE MODELS

Payload capacities of these "Eucs" are 7, 12 and 18 yds. struck . . . 9, 16 and 25 yds. heaped. Over-hung engine design of tractors provides excellent maneuverability and ease of handling in difficult work . . . engines are 143, 300 and 335 h.p.

TWIN-POWER SCRAPER

With a total of 518 h.p., this Euclid has a struck capacity of 24 yds. . . . 32 yds. heaped. Two engines, each having a separate Torqmatic Drive, enable this "Euc" to work independent of other equipment and move more yards at lowest cost on any scraper job.

Your Euclid dealer can supply performance and cost data on the Euclid Scrapers best suited to your operations. Have him show you why Euclids are your best investment.

EUCLID DIVISION, GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

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FOR MOVING EARTH, ROCK, COAL AND ORE

TO ANY SIZE OR KIND OF JOB

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S-7 Model S-7 is equipped with 143 h.p. engine . . . 18.00 x 25 tires . . . 4-speed Torqmatic Drive . . . full hydraulic 90° steering. Capacity is 7 cu. yds. struck and 9 yds. heaped at 1:1 slope. Optional tires are 21.00 x 25.

S-12 Powered by a 218 h.p. engine, the Euclid S-12 Scraper has a 5-speed transmission . . . 24.00 x 25 tires . . . full hydraulic 90° steering. Struck capacity is 12 cu. yds. . . . at 1:1 heap, 16 yds.

S-18 This Model S-18 has a 300 h.p. engine with 4-speed Torqmatic Drive. Struck capacity is 18 cu. yds. . . . 25 yds. at 1:1 heap. Tires are 27.00 x 33 with 33.50 x 33 optional . . . full hydraulic 90° steering.

FDT This 4-wheel tractor model has a struck capacity of 12 cu. yds. . . . 16 yds. heaped . . . and is available with 200 or 218 h.p. engine and 5-speed transmission. Tire sizes are 12.00x25 front and 21.00x25 on drive and scraper wheels with 24.00x25 optional.

SS-18 The Model SS-18 has a 300 h.p. engine and 3-speed Torqmatic Drive. Capacity is 18 cu. yds. struck and 25 yds. heaped. Front tires are 14.00 x 25 . . . 24.00 x 25 tires on drive and scraper wheels with 29.5 x 25 optional . . . hydraulic booster steering.

SS-24 A 300 or 335 h.p. engine with Allison 4-speed transmission and converter lock-up powers the Model SS-24. Struck capacity is 24 cu. yds. . . . 32 yds. heaped. Front tires are 14.00 x 25 . . . drive and scraper tires are 27.00 x 33 with 33.50 x 33 optional for maximum traction and flotation.

TS-24 The Model TS-24 has a 300 h.p. engine for the tractor and a 218 h.p. engine for the scraper . . . each with a separate Torqmatic Drive. Heaped capacity at 1:1 is 32 cu. yds. . . . 24 yds. struck. Full 90° hydraulic steering . . . 27.00 x 33 tires with 33.50 x 33 optional.

"Euc" Scrapers have hydraulic lever action, 4 section adjustable and reversible cutting edges, unequalled accessibility and other cost-cutting advantages. Check the complete Euclid line before you decide on any scraper equipment.

UPPER: This EIMCO 105 FRONT-END LOADER barely had its "wraps" off before being initiated into the MANAFORT BROTHERS' work force . . . clearing debris from a million dollar fire in the heart of the business district, Meriden, Conn. Says ANTHONY (TONY) MANAFORT, president: "We took a long look at the tractor-loader market and finally chose Eimco. After its performance at Meriden, we're glad we did; it fits our needs to a T."

LEFT: In New England — wherever antiquated structures are being razed to make room for modern offices, factories or dwellings . . or where there's a tough clean-up project going on . . . it's very possible you'll find MANAFORT BROTHERS on the job. And you'll likely find one (or any combination of) the MANAFORTS around to see that work is moving on schedule. Introducing them left to right: ANTHONY, brothers PAUL AND FRANK and son JIM.

"Our Eimco 105 made a 'hit' with us on the first job..."

This comment by **Anthony (Tony) Manafort** referred to the satisfaction of he, his brothers **Paul** and **Frank** and his son **Jim,** in their new **Eimco 105 Front-End Loader** after it had speedily cleared debris from a $1 million fire in Meriden, Conn.

Since it's their business to remove the "old" to make way for the "new" . . . it's normal for the **Manafort Brothers** of **New Britain, Conn.,** to do their own "wrecking." But tough, unscheduled clean-up jobs such as the Meriden fire have a way of sneaking in on a busy work calendar . . . an important reason why the **Manaforts** must continually plan for faster equipment to handle more and bigger jobs.

"We depend on our tractors to do a lot of different jobs," Tony explains, "pry-out concrete, knock down brickwork, dig and load fast, tow, push, grade . . or a dozen other things. They have to be rugged 'cause we can't afford to baby equipment to keep it working. The Eimco has given us top performance on every job."

It's easy to understand why the **Manaforts** enjoy satisfaction in the outstanding performance of their **Eimco 105.** With independent track reversal, it maneuvers fast and sharp; power shifts provide quickly responsive, precise control from full reverse to full forward speeds with a minimum of physical exertion; from his up-front position, the operator works faster with more accuracy at less strain; Eimcos stay at work without excessive, time-consuming delays for maintenance and repairs, and they offer outstanding front-end versatility for handling scores of different jobs, economically.

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HANDLE ANY AGGREGATE PRODUCING JOB —With specifications increasingly strict, the producer whose plant is *engineered to his specific job* will profit most. In the complete Cedarapids line, there's a size and type of component to meet your specifications in any volume desired.

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To meet primary crushing needs, Cedarapids offers Single Jaw or Twin Jaw Crushers and Double Impeller Impact Breakers in a complete range of sizes. Used as large separate units, or in portable plants, all Cedarapids crushers are engineered for the highest capacity and long, trouble-free life. The addition of vibrating grizzlies or scalping screens greatly increases production for more profitable operation.

Two 3042 Double Impeller Impact Breakers used for primary reduction

Four 48" x 12' Cedarapids double deck Screens accurately grade the crushed stone

CEDARAPIDS HORIZONTAL VIBRATING SCREENS

Horizontal Vibrating Screens give 12% more effective screening area than inclined screens of the same length, plus 20% to 30% more effective gradation. With the horizontal position of the screen and almost vertical fall of material, the full area of each screen cloth opening is available for material to pass through.

Two 4024 Cedarapids Roll Crushers used for secondary crushing in this efficient stationary set-up

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World Conference Focuses on

Prestressed Concrete in the Road Program

The economic possibilities of prestressed concrete as a bridge and pavement type were reviewed at the San Francisco Conference. Need for continuing research was cited by various speakers, with warning that strict adherence to approved design standards and quality concrete procedures is imperative in the use of this "engineered material."

By Hubert C. Persons **Contributing Editor to Roads and Streets**

PRESTRESSED concrete for highway bridges and airfield pavements was given major attention at the World Conference on Prestressed Concrete in San Francisco, July 29 to August 2. The conference program covered a wide range of structural applications for prestressing in both the United States and foreign countries. Attendance was more than 1,200. Twenty-six foreign countries including Russia were represented.

The conference was sponsored by the University of California, department of engineering, in cooperation with 11 professional and technical organizations including the American Association of State Highway Officials and the American Society of Civil Engineers. The third annual meeting of the Prestressed Concrete Institute was held at the same time and place.

Investigations and tests of prestressed concrete paving made by the U.S. Army Corps of Engineers and the Bureau of Public Roads were described by speakers. Those two federal agencies and the AASHO were credited with influencing strongly the spectacular developments in prestressed concrete during the past few years.

William E. Dean, assistant state highway engineer of Florida, was keynote speaker on the opening program. Mr. Dean was a member of the AASHO—Prestressed Concrete Institute joint committee which recently recommended four "I" beam sections adaptable for use in all highway bridge spans from 30 to 100 ft. The speaker cited the work of the Bureau of Public Roads as having been especially effective in bringing about the adoption of prestressing for highway bridges. He said prestressing could not have advanced as it has except for the cooperation and sharing of ideas by all segments of the industry.

Mr. Dean injected a warning into his remarks, saying: "I am sometimes disturbed at the thought that we might get careless in assuming that we have now overcome the weakness of concrete. Quality must not be allowed to slip. We must remember that prestressed concrete is an engineered material. Carelessness must be guarded against. Designers must exercise care. Poor workmanship on the job must not be allowed to nullify engineering advances."

Quality Control Essential

The speaker also declared that the potential development in the field of prestressed concrete is beyond comprehension. "The future is not only promising but it is fantastic," he said. "This industry is barely coming of age now."

In the July 30 session on bridges, another state highway official, Arthur L. Elliott, bridge engineer of the California division of highways, declared that standards of workmanship for prestressing operations are urgently needed. He said there should be recognized standards of both workmanship and quality. Mr. Elliott pointed out that, in handling prestressing, "we are dealing with a live force." He said that some contractors are afraid of prestressing and emphasized the fact that, as with any specialized process, specialized experience is needed. He expressed the opinion that the manufacturers of prestressing components have a responsibility to see that those components are used properly, and called attention to the fact that there have been serious suggestions that sub-contractors entering the field of prestressing should be licensed. He said that one difficulty is that the numerous systems of jacking, anchoring and grouting are confusing to contractors and owners. The State of California, Mr. Elliott said, has built many prestressed concrete bridges and will build many more. He said he hoped the experience of the division of highways would be helpful in showing others how to avoid the pitfalls in use of this relatively new construction method.

E. L. Erickson, chief of the bridge branch, Bureau of Public Roads, detailed the steps which led the bureau to issue its "Criteria for Prestressed Concrete Bridges." He said the bureau's chief interest in publishing these criteria was to "produce something as protection against bad design assumptions and

(Continued on page 121)

NEW MACK

heavy-duty four- and six-wheel dumpers

15- to 34-ton capacity

✻ LARGEST SELECTION OF HEAVY DUMPERS

Mack offers you the most complete line of dumpers for mining, quarrying, road building, construction. From heavy-duty 170 horsepower, four-wheel dumpers with 15-ton capacities to super-duty 400-horsepower, six-wheel dumpers with 34-ton capacities, Mack provides the economy and performance that can mean bigger hauling profits for you.

✻ CHOICE OF ENGINES

Mack offers you a choice of engines . . . Cummins diesels in the 300- and 400-horsepower class . . . or Mack Thermodyne and Cummins diesels in the 170 to 205 horsepower class. No need to alter existing maintenance facilities to handle new engine makes . . . you get the truck you want with the engine you want.

✻ OUTSTANDING PERFORMANCE

When you buy Macks, you know that you are getting top performance, outstanding economy, maximum dependability—qualities that have made Mack the acknowledged heavy-duty truck leader in the industry. Moreover, Mack dumpers are planned for accessibility throughout . . . engines are easily reached, no place in the suspension ever needs adjustment—these and many more Mack features reduce maintenance costs and make routine servicing easier. And in Macks, you get the finest transmissions and axles available . . . made by Mack and found only in Macks!

✻ COMPETITIVELY PRICED

Mack off-highway dumpers are priced right in line with competitive makes. Yet, with Macks, you get those "extras" that mean more payloads at lower hauling costs . . . cabs engineered for maximum driver efficiency . . . specially designed components with extensive use of heat-treated alloy steels . . . single-unit all-welded frames that can take plenty of hard knocks . . . outstanding performance and economy from a complete line of engines.

✻ STOCK DELIVERY

All 15 and 22½-ton Mack dumpers are available from stock. The units you want with the engines and transmissions you want can be supplied upon gratifyingly short notice. There are no delays, no production schedules for you to worry about. For more information on delivery, contact your local Mack Dealer or Representative.

MACK LRX

capacity: 15 tons

This four-wheel, off-highway dumper combines a big 15-ton rated capacity with outstanding maneuverability. Either a Mack or Cummins Diesel engine —along with heavy-duty clutch, 10-speed transmission, and Mack's Planidrive rear axle assembly —gives plenty of pulling power for long hauls on steep grades. Rugged, unified frame assembly, powerful air brakes, and comfortable cab with driver's position offset to the left assure the top performance and efficiency that have made the LRX a highly popular dumper in mine, quarry, and road-building operations.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:	14.00-24 Rear Tire
Wheel Base	13′ 4″
Platform	9′ 1″
Overall Width	9′ 11″
Overall Height	10′ 8″
Overall Height (Body Raised)	18′ 8″
Overall Length	24′ 7½″
Turning Circle Diam. (To outside edge of tire)	60′
Weight (Chassis, Body & Hoist)	33,000 lbs.
Payload	30,000 lbs.

ENGINE (Diesel):

Model	END 673
Make	Mack, Thermodyne
Type	Naturally aspirated
Number of cylinders	Six
Bore and stroke	4⅛″ x 6″
Piston displacement, cu. in.	672
Brake horsepower @ 2100 r.p.m. (gov.)	170
Max. torque @ 1200 r.p.m.	480 lb.-ft.

CLUTCH (Available with END 673 only):

Type	Mack single-plate, dry
Area of engagement, sq. in.	253

ELECTRICAL SYSTEM:

Voltage and capacity . 12 V., 50 Amp. (24 V., Starting)

TRANSMISSION:

Type	Mack selective, constant mesh
No. of speeds, forward	Ten
reverse	Two

FRONT AXLE:

Make . Mack Reversed-Elliott, drop-forged I-beam

REAR AXLE:

Make	Mack Planidrive
Drive	Dual Reduction
Final Drive (3rd reduction)	Planetary gear train within wheel hubs
Total Ratio	16.5

BRAKES (Air):

Compressor	Tu-Flo
Type	Internal expanding
Front, size	17¼″ x 5″ x ¾″
Rear, size	20″ x 7″ x ¾″
Hand, size	12″ x 5″ x ⅜″, Bendix

FRAME:

Side-members, size	12½″ x 6¼″ x ½″, wide flange I-beam, rolled section
Section modulus	60.7 (per rail)

SPRINGS:

Front, type	Semi-elliptic
Rear, suspension	Semi-rigid, axle mounted to frame

WHEELS:

Type . . . . . Cast, spoke

STEERING GEAR:

Control . . . . . Manual

TIRES:	Front	Rear
Size	12.00-24 (16P) Rib	14.00-24 (20P) Lug

CAB:

Type: Heavy-duty off-highway, closed, all-steel welded. Offset 10¾″ to left of chassis centerline provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Front and rear tow pins; air horn on cab roof; cab entrance steps and platforms; rear view mirror, left side; channel type front bumper; dual windshield wipers; vertical exhaust; stop-tail light; rim lug wrench and handle.

HOIST:

Make & model	Heil

Type-Twin, double-acting, 8″ diameter, hydraulic cylinders with 24″ stroke, 70° dumping angle.

BODY:

Type	Rock, with scoop end
Make	Heil
Capacity, line of plate	9.8 cu. yds. struck

Construction: ¼″ steel plate shell bottom; ⅜″ sides and header; ½″ wear and side bevel plates; ¼″ canopy. 3″ x 5 lb. channels between floor plates either side of a 1⅝″ edge-grain hardwood middle section filler.

OPTIONAL EQUIPMENT

ENGINE (Diesel):

Model	NHB	ENDT 673
Make	Cummins	Mack, Thermodyne
Type	Naturally aspirated	Turbocharged
Number of cylinders	Six	Six
Bore and stroke	5½″ x 6″	4⅛″ x 6″
Piston displacement cu. in.	743	672
Brake horsepower @ 2100 r.p.m. (gov.)	200	205
Max. torque @ r.p.m.	1200	1400-1600
pound-feet	537	560

CLUTCH (Included with NHB and ENDT 673):

Type	Mack two-plate, dry
Area of engagement, sq. in.	416

TIRES:	Front	Rear
Size	13.00-24 (18P) Rib	16.00-25 (20P) Lug

BODY:

Type	Flared Quarry
Make	Heil
Capacity, line of plate	11 cu. yds. struck

Construction: ¼″ steel plate shell bottom; ½″ sides; ½″ header, slope; ⅝″ header, vertical; ½″ wear plate; ¼″ canopy. 3″ x 5 lb. channels between floor plates either side of a 1⅝″ edge-grain hardwood middle section filler.

Body Equipment: (for std. and opt. bodies)—(9) ¾″ x 6″ alloy wear bars; rock ejectors; ½″ alloy wear plate; horizontal bolsters (3 per side); canopy, loose for export shipment. (for std. body only): exhaust heating connections; welded-on side boards.

CHASSIS EQUIPMENT: Automatic radiator shutters; Wagner "BB" (24 hour chart 0-3500 r.p.m.) tachograph, in place of standard Tachometer; speedometer; hubodometer, left front wheel; Vickers power steering; front wheel limiting valve; hand control valve to operate rear service brakes; low air pressure indicator, Wig-Wag type; screen type radiator guard; 25,000 B.T.U. hot water cab heater with defrosters; spare rim; hydraulic jack, 20-ton; air starting; cold starting equipment; insulating dash mat.

MACK — FIRST

MACK LVX

capacity: 22½ tons

This four-wheel dumper with its 22½-ton rated capacity provides maximum payloads at minimum unit cost. Equipped with either a 300 or 335-horsepower engine, over-gear transmission with two-speed compound or torque converter, and Mack's exclusive Planidrive rear axle assembly, it is powered to give top performance under the most punishing operating conditions. All-welded, single-unit, alloy-steel frame gives LVX's stamina and rugged durability. Elbow steering column, hydraulic steering booster, two-plate air-assisted clutch, and job-engineered cab with extreme left driver position assure maximum operating efficiency. From top to bottom, this big Mack gives you the "extras" that mean minimum hauling costs.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:

Wheelbase	14' 2"
Platform	9' 11"
Overall Width	11' 2"
Overall Height	11' 4⅛"
Overall Length	26' 7½"
Overall Height (Body Raised)	21'
Turning Circle Diam. (To outside edge of tire)	62'
Weight (chassis, body & hoist)	40,800 lbs.
Payload	45,000 lbs.

ENGINE (Diesel):

Model	NHRBIS
Make	Cummins
Type	Supercharged
Number of cylinders	Six
Bore and stroke	5½" x 6"
Piston displacement, cu. in.	743
Brake horsepower @ 2100 r.p.m. (gov.)	300
Max. torque @ 1500 r.p.m.	818 lb.-ft.

CLUTCH:

Type	Mack Two-plate, dry
Area of engagement, sq. in.	416
Actuation	Manual, with air assist

ELECTRICAL SYSTEM:
Voltage and capacity . 12 V., 50 Amp. (24 V. Starting)

TRANSMISSION:

Type	Mack selective, constant mesh
No. of speeds, forward	Eight
reverse	Two

FRONT AXLE:
Type . . . Mack Reversed-Elliott, drop-forged I-beam

REAR AXLE:

Make	Mack Planidrive
Drive	Dual Reduction, spiral bevel
Final drive (3rd reduction)	Planetary gear train within wheel hubs
Total Ratio	17.66

BRAKES (Air):

Compressor	Tu-Flo
Type	Internal expanding
Front, size	17⅛" x 5" x ¾"
Rear, size	18" x 10" x ⅜"
Hand, size	12" x 5" x ⅜"

FRAME:

Type	I-beam, wide flange
Material	Alloy steel
Side-members, size	13 11/16" x 8" x ⅝" (Fabricated)
Section modulus	74.8 per rail

SPRINGS:

Front	
Type	Semi-elliptic
Suspension	Mack rubber shock insulators
Rear	
Type	Progressive rate, semi-elliptic
Suspension	Cam face slipper ends with radius rods

TIRES:	Front	Rear
Size	14.00-24 (16P) Rib	18.00-25 (24P) Lug

WHEELS:
Type . . . . . Cast, spoke

STEERING GEAR:
Power steering assist . . . Vickers hydraulic booster

CAB:
Type . Heavy-duty off-highway, closed, all-steel, welded. Cab offset 10¼" to left of chassis centerline provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Screen type radiator guard; front and rear tow pins; air horn on cab roof; dual windshield wipers; two air reservoirs; rear view mirror, left side; Mack power take-off and control (not available with Allison Transmission); door in hood side for access to oil filler and dip stick; exhaust through hood with inline muffler; channel type front bumper; stop-tail light; rim lug wrench and handle.

HOIST:
Type . . . Twin, double-acting, outboard mounted, three section telescopic cylinder assembly directly connected to body and chassis through a universal joint arrangement providing a 70° dumping angle.

BODY:

Type	Rock, with scoop end
Make	Heil
Capacity, line of plate	14.8 cu. yds. struck

Construction: ¼" steel plate shell bottom; ⅜" sides and header; ½" wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler.

OPTIONAL EQUIPMENT

ENGINE:

Model	NRTO
Make & type	Cummins, turbocharged
Number of cylinders	Six
Bore and stroke	5½" x 6"
Piston displacement, cu. in.	743
Brake H.P. @ 2100 r.p.m. (gov.)	335
Max. torque @ 1500 r.p.m.	900 lb.-ft.

TRANSMISSIONS:
Westinghouse Converter and Mack 4-Speed Transmission. Clutch—2-plate, 17", air actuated.
Allison Torqmatic Converter and Allison Transmission.
Twin Disc Converter and Mack 4-Speed Transmission.

FRONT AXLE: Special Heavy-duty, Reversed-Elliott, Drop-Forged I-beam.

TIRES:	Front
Size	14.00-24 (20P) Rib

BODY:

Type	Flared Quarry
Make	Heil
Capacity, line of plate	15.2 cu. yds., struck

Construction: ¼" steel plate shell bottom; ½" sides; ⅜" header; ½" wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler.

Body Equipment: (for std. and opt. bodies): (9) ¾" x 6" alloy wear bars; rock ejectors; horizontal bolsters (3 per side); canopy toe board; rock guards over tires; canopy, loose for export shipment. (for std. body): welded-on side boards; exhaust heating connections.

CHASSIS EQUIPMENT: Air starting, Ingersoll-Rand 9HP; Tachograph, Wagner "BB" (24 hour chart 0-3500 r.p.m.) in place of standard Tachometer; Wig-Wag low air pressure indicator; hand control valve to operate rear service brakes; front wheel brake limiting valve; 25,000 B.T.U. hot water cab heater with defrosters; windshield fan mounted on windshield header; hub-odometer; engine chrome cylinder liners and stellite inlet valve seats; insulating dash mat; fender to bumper treads; air operated radiator shutter; air operated Thermo-controlled radiator fan hub; speedometer; back-up light; hydraulic jack, 30-ton; spare rims.

NAME FOR TRUCKS

MACK LRSW

capacity: 30 tons

Powered by either a 300 or 335-horsepower engine, this 30-ton, six-wheel dumper has what it takes for off-highway operation in mines, quarries and earth-moving projects. Smooth application of power to its balanced, four-wheel drive bogie is obtained by an air-assisted clutch and overgear transmission with two-speed compound or torque converter.

Convenient location of controls, angle steering column, hydraulic steering booster, and extreme left driver position give easy and efficient handling. Best materials, precision manufacture, and specially engineered components make the LRSW capable of withstanding the toughest 'round-the-clock hauling.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:

Wheelbase	16′ 10″
Platform	14′ 11½″
Overall Width	11′ 2⅜″
Overall Height	11′ 6½″
Overall Length	29′ 2⅞″
Overall Height (Body Raised)	24′ 10″
Turning Circle Diam. (To outside edge of tire)	78′
Weight (chassis, body & hoist)	60,000 lbs.
Payload	60,000 lbs.

ENGINE (Diesel):

Model	NHRBIS
Make	Cummins
Type	Supercharged
Number of cylinders	6
Bore and stroke	5½″ x 6″
Piston displacement, cu. in.	743
Brake horsepower @ 2100 r.p.m. (gov.)	300
Max. torque @ 1500 r.p.m.	818 lb.-ft.

CLUTCH:

Type	Mack two-plate, dry
Area of engagement, sq. in.	416
Actuation	Manual, with air assist

ELECTRICAL SYSTEM:

Voltage and capacity	12 V., 50 Amp. with 24 V., starting

TRANSMISSION:

Type	Mack two-lever, Duplex
No. of speeds, forward	Eight
reverse	Two

FRONT AXLE:

Type . . . . Mack Reversed-Elliott, drop-forged I-beam

BOGIE:

Make	Mack Planidrive
Final drive, type	Four-wheel, planetary
Inter-axle differential, type	Mack concentric cam and plunger Power Divider
Carriers	Mack Dual Reduction
Total Ratio	18.18

BRAKES:

Type and actuation	Internal expanding, inclosed, air
Front, size	17½″ x 5″ x ¾″
Rear, size	20″ x 7″ x ¾″
Hand, size	12″ x 5″ x ⅜″

FRAME:

Type	I-beam, wide flange
Material	Alloy steel
Side-members, size	13 15/16″ x 8″ with ⅝″ web and top flange, ⅞″ bottom flange
Section modulus	84.5 per rail

SPRINGS:

Type, front	Semi-elliptic
rear	Semi-elliptic, inverted
Suspension, Mack	Rubber Shock Insulators

SHOCK ABSORBERS, FRONT:

Type . . . . Houdaille, hydraulic

TIRES (Lug):	Front	Rear
Size	14.00-24 (20P)	16.00-25 (20P)

WHEELS . . . . Cast, spoke

STEERING GEAR:

Power steering assist . . . Vickers hydraulic booster

CAB:

Type . . Heavy-duty off-highway, closed, all-steel, welded. Offset 10⅛″ to left of chassis centerline provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Hubodometer; screen type radiator guard; front and rear tow pins; air horn; rear view mirror, left side; exhaust through hood with in-line muffler; channel type front bumper; door in hood side for access to oil filler and dip stick; insulating dash mat; wig-wag low air pressure indicator; windshield wipers; stop and tail light; back up light; rim lug wrench and handle; automatic radiator shutters.

HOIST:

Make	Heil

Type—Twin, double-acting, 10″ diameter, hydraulic cylinders with 40″ stroke, 70 dumping angle with power return.

BODY:

Make and type	Heil, Rock-scoop end
Capacity, line of plate	21 cu. yds.

Construction: ¼″ steel plate shell bottom; ⅜″ sides and header; ⅜″ slope section; ⅜″ alloy wear and side bevel plates; ¼″ canopy. 3″ x 7.1 lb. channels between floor plates either side of a 2″ edge-grain hardwood middle section filler.

OPTIONAL EQUIPMENT

ENGINE:

Make and model	Cummins, NRTO
Number of cylinders	Six
Bore and stroke	5½″ x 6″
Piston Displacement cu. in.	743
Brake horsepower @ 2100 r.p.m. (gov.)	335
Max. torque @ 1500 r.p.m.	900 lb.-ft.
Turbocharger	Turbine, exhaust driven

TRANSMISSIONS:

Westinghouse Converter and Mack 4-Speed Transmission. Clutch—2-plate, 17″, air actuated.
Allison Torqmatic Converter and Allison Transmission.

WHEELS, TIRES:

Front & rear Wheels, type	Cast spoke
Tires, size	16.00-25
Ply-rating, front	20 or 24
rear	24

BODY EQUIPMENT: (9) ¾″ x 6″ alloy wear bars; 1″ alloy wear plate; rock ejectors; horizontal bolsters (4 per side); twin body prop; rock guards over tires; exhaust heating connections; canopy, loose (for export shipment).

CHASSIS EQUIPMENT: Air starting, Ingersoll-Rand 9HP; chrome cylinder liners and stellite inlet valve seats; air operated Thermo-controlled radiator fan hub; Tachograph, Wagner model "BB" (24 hour chart 0-3500 RPM) in place of standard Tachometer; speedometer; front wheel brake limiting valve; alcohol vaporizer; cab insulated; exhaust outlet under cab suitable for attachment to body for body heating; 25,000 B.T.U. hot water cab heater with defrosters; solex glass for windshield; windshield fan mounted on windshield header; fender to bumper steel treads; two stop-tail lights; 20-ton hydraulic jack; spare rim.

MACK — FIRST

MACK LRVSW

capacity: 34 tons

The 34-ton rated capacity of this super-payload, six-wheel dumper assures minimum haulage costs for the big earth-moving jobs. Equipped with a 400-horsepower engine, four-speed overgear transmission, hydraulic torque converter or two-speed compound, and a balanced, four-wheel drive bogie, LRVSW's can negotiate severe grades fully loaded. Maneuverability and ease of handling are facilitated by such features as a hydraulic steering booster and air-assisted clutch. Heat-treated, stress-proportioned, single-unit frame gives the structural stamina needed to withstand severest operating conditions. All these features, and many more, contribute to unmatched durability and minimum haulage costs.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:

Wheelbase	16′ 10″
Platform	14′ 11½″
Overall Width	11′ 2⅜″
Overall Height	11′ 7⅛″
Overall Length	31′ 3¼″
Overall Height (Body Raised)	25′ 2″
Turning Circle Diameter (To outside edge of tire)	78′
Weight (chassis, body & hoist)	68,000 lbs.
Payload	68,000 lbs.

ENGINE (Diesel):

Model	NVH-1200
Make	Cummins
Type	Naturally aspirated
Number of cylinders	12
Bore and stroke	5½″ x 6″
Piston displacement, cu. in.	1486
Brake horsepower @ 2100 r.p.m. (gov.)	400
Max. torque @ 1200 r.p.m.	1,075 lb.-ft.
Fuel tank and location	150 gal., back of cab

CLUTCH:

Make	Lipe Rollway
Type	Two-plate, dry
Area of engagement, sq. in.	571
Actuation	Air

ELECTRICAL SYSTEM:

Voltage and capacity	12 V., 75 Amp.
Generator, make and type	Leece-Neville, alternator

STARTING SYSTEM:

Starting motor, type	Air
Make	Bendix-Westinghouse
Rating, horsepower	25
Cold starting aid	Ether injection

TRANSMISSION:

Type	Mack selective constant mesh
No. of speeds, forward	Four
reverse	One

TORQUE CONVERTER:

Model	Westinghouse 18″
Type	Single stage, hydraulic

FRONT AXLE:
Type . . . . Mack Reversed-Elliott, drop-forged I-beam

BOGIE:

Make	Mack Planidrive
Final drive, type	Four wheel, planetary
Inter-axle Differential	Mack concentric cam and plunger type Power Divider
Carriers	Mack Dual Reduction
Total ratio	18.18

BRAKES:

Type and actuation	Internal expanding, inclosed, air
Front, size	17¼″ x 5″ x ¾″
Rear, size	20″ x 7″ x ¾″
Hand, size	12″ x 5″ x ⅞″

FRAME:

Type	I-beam, wide flange
Material	Alloy steel
Side-members, size	Depth 14¼″, flange width 8″, flange thickness 1″
Section modulus	130.0 per side

SPRINGS:

Type	Semi-elliptic
Suspension, Mack	Rubber Shock Insulators

SHOCK ABSORBERS, FRONT:
Type . . . . Houdaille, hydraulic

TIRES (Lug) Front and Rear:
Size 16.00-25 (20P)

WHEELS:
Type . . . . Cast, spoke

STEERING GEAR:

Type	Worm and roller
Power steering assist	Vickers hydraulic booster

CAB:
Type . . Heavy-duty off-highway, closed, all-steel, welded. Offset 10¾″ to left of chassis centerline provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Screen type radiator guard; hubodometer; front and rear tow pins; air horn; rear view mirror, left side; dual exhaust through hood with inline mufflers; channel type front bumper; rim lug wrench and handle; door in hood side for access to oil filler and dip stick; insulating dash mat; windshield wipers; stop and tail light; back up light; automatic radiator shutters.

HOIST:

Make & Type	Heil, twin, double-acting, outboard mounted, four-section telescopic cylinder assembly directly connected to body and chassis through a universal joint arrangement to provide maximum flexibility.
Dumping angle	70°

BODY:

Make & Type	Heil Rock, scoop end
Capacity, line of plate	24 cu. yds. struck

Construction: ¼″ steel plate shell bottom; ⅜″ sides and header; ¾″ alloy wear and side bevel plates; ½″ front slope plate; ¼″ canopy. 3″ x 7.1 lb. channels between floor plates either side of a 2″ edge-grain hardwood middle section filler

OPTIONAL EQUIPMENT

TRANSMISSION (In place of 4-Speed and Westinghouse Converter):

Make & Type	Mack Two-Lever, Duplex
Speeds Forward	8
Speeds Reverse	2

TIRES (Lug) Front and Rear:
Size 16.00-25 (24P)

BODY EQUIPMENT: (9) ¼″ x 6″ wear bars over standard ¾″ alloy wear plate; 1″ alloy wear plate in place of ¾″ alloy wear plate; exhaust heating; rock ejectors; rock guards over tires; twin body prop; horizontal bolsters (5 per side).

CHASSIS EQUIPMENT: Air operated Thermo-controlled radiator fan hub; Tachograph, Wagner model "BB" (24 hour chart 0-3500RPM) in place of standard Tachometer; speedometer; front wheel brake limiting valve; alcohol vaporizer; 25,000 B.T.U. hot water cab heater with defrosters; solex glass for windshield; windshield fan mounted on windshield header; fender to bumper steel treads; cab insulated; two stop-tail lights; spare rim; 20-ton hydraulic jack.

NAME FOR TRUCKS

only MACK gives you features like these...

MACK-BUILT FRONT AXLES

Mack's reversed Elliott, drop-forged I-beam front axles are made extra strong for long, trouble-free service. Extensive use of heat-treated steels for crucial parts means minimum maintenance. Straight tie rod and rugged construction of air-actuated brake shoes insure top performance.

MACK-BUILT 2-WHEEL REAR AXLES

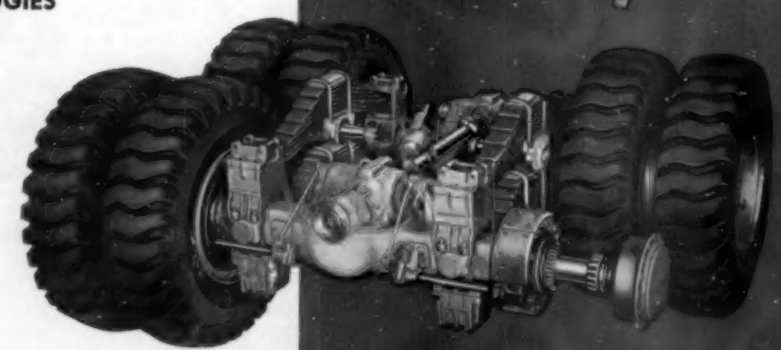
Mack's two-wheel, rear axle assemblies have an unmatched reputation for durability under strenuous service. The strongest, most wear-resistant materials are used throughout. Dual Reduction, gear-type differential and Mack's famous planetary gear reduction at the wheel hubs (Planidrive) provide the smooth distribution of power needed for top truck performance. Planetary gears can be serviced or repaired without removing tires or disturbing wheel bearing adjustment.

MACK-BUILT TRANSMISSIONS

Dependable performance and long life are standard in Mack transmissions. Shown here is the heavy-duty overgear transmission used for the LRVSW, LRSW, and LVX off-highway dumpers. The four-speed main transmission and two-speed compound are assembled as a unit to give eight forward and two reverse speeds. The four-speed main transmission without the two-speed compound is offered in combination with torque converter. All gears use Mack tetrapoid or quadrapoid tooth design and are drop-forged and case-hardened . . . gears noted for lasting the life of the truck.

MACK-BUILT 4-WHEEL BALANCED BOGIES WITH EXCLUSIVE POWER DIVIDER

Under the worst conditions of mud, loose gravel, or difficult terrain, you get maximum pulling power with Mack's four-wheel drive Balanced Bogies because exclusive Mack Power Dividers apply power to the wheels with traction. Planidrive final reduction gears in all four hubs provide needed reduction without excessively large carriers, differentials, or axle shafts. Maintenance is reduced to a minimum.



MACK first name for TRUCKS

Mack Trucks, Inc., Plainfield, New Jersey • **In Canada: Mack Trucks of Canada, Ltd.**

Shave Highway Construction Costs with Bucyrus-Erie Cranes

You can rely on Bucyrus-Erie for best possible service under any type of working condition. The 51-B shown here sets steel pilings for a bridge in Pittsburgh, Pa.

From the ground up, Bucyrus-Erie cranes are designed and built to put power and strength to work hoisting and placing loads quickly and smoothly. You'll find them lowering costs on many phases of highway construction work — driving piles, placing bridge beams, unloading and stockpiling materials, and (with clamshell bucket) excavating for structure foundations.

These cranes have great stability and long reach. And their reliable performance is accented by low cost maintenance.

Get the facts on these convertible cranes from your Bucyrus-Erie distributor today.

364E57

BUCYRUS ERIE

A Familiar Sign at Scenes of Progress

BUCYRUS-ERIE COMPANY

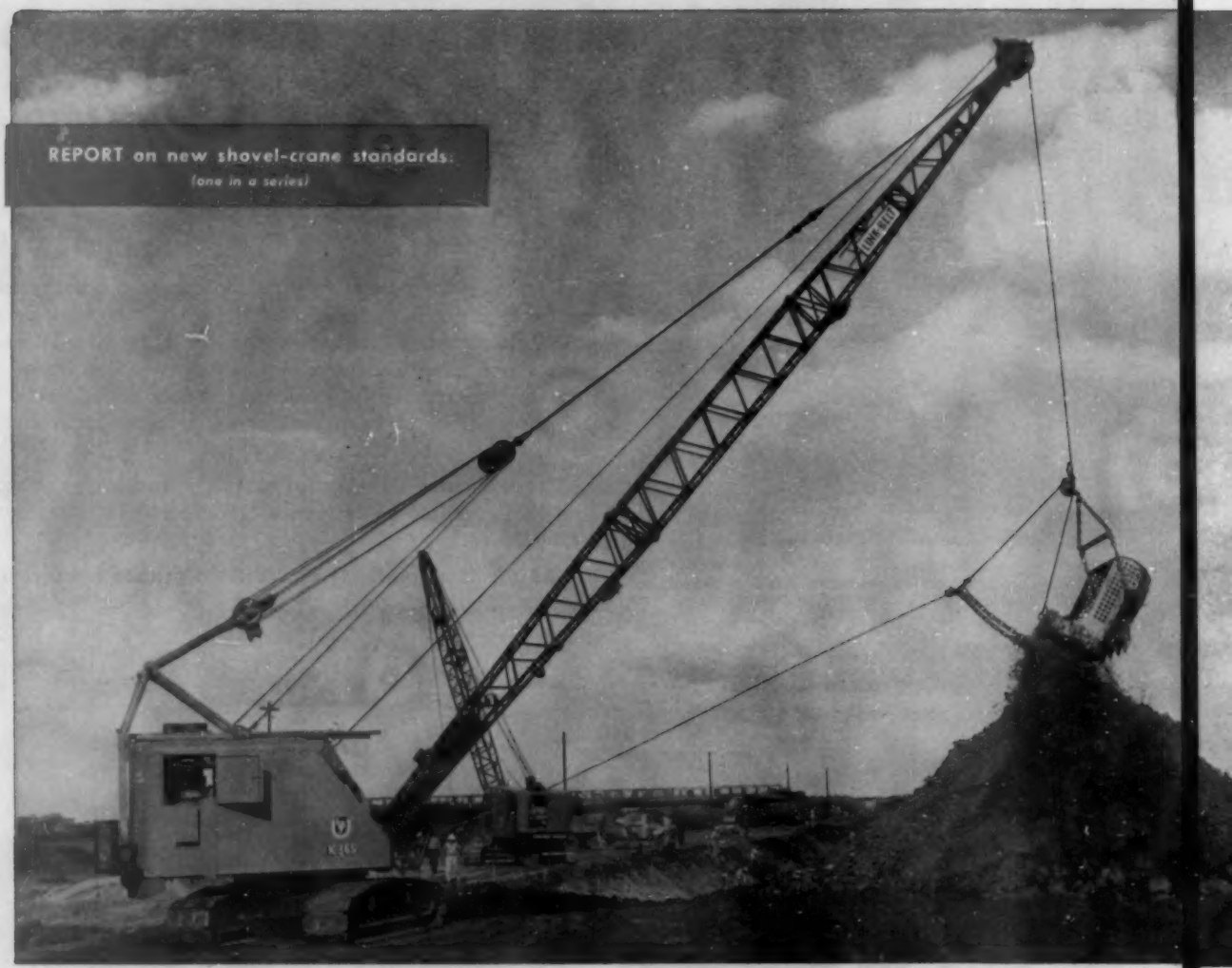
South Milwaukee, Wisconsin

Speedy Transit Cranes have the power and control to lift heavy loads with great accuracy. Here, a 22-B erects steel for a traffic overpass on a redevelopment job in Nashville, Tenn.

Equipped with clamshell bucket, this 54-B digs the foundation for a freeway bridge in Cleveland, Ohio. Long, wide, tapered end mountings provide big bearing area for soft ground operation.

Bucyrus-Erie dependability makes these machines ideal for all phases of highway construction. This 22-B crane unloads concrete pipe to be used on a highway job in Puerto Rico.

. . . for more details circle 245 on enclosed return postal card



Upping cycles per shift with

Standard on every Link-Belt Speeder, Speed-o-Matic fingertip controls minimize operator fatigue. Response is fast, positive, precise

Exclusive with Link-Belt Speeder, this true power hydraulic control system utilizes oil under pressure. An engine-driven pump supplies pressure to put the machine through its paces at the flick of the operator's wrist. Result—he's not subject to costly end-of-the-shift letdown... he stays fresh, works at high speed *all* shift.

Hydraulic-actuated clutches . . .

engage smoothly, surely . . . eliminate jerk, jump or lag. There's perfect feel of the load for high-speed with safety and accuracy. Self-compensating for heat and normal lining wear, the clutches eliminate frequent stops for clutch adjustments . . . convert downtime into productive time.

Advanced design throughout

When you put a Link-Belt Speeder on your job, you get a machine that's years ahead of the field . . . a machine tops in production profit, unusually low in maintenance and service costs. See how you, too, can set new high standards of shovel-crane performance, earn bigger return on your equipment investment. See or call your Link-Belt Speeder distributor for the complete story or write: Link-Belt Speeder Corporation, Cedar Rapids, Iowa. 14.323

High-speed excavating

K-365 dragline with 1¾-yard bucket at left features exclusive Speed-o-Matic controls as standard equipment. System utilizes oil under pressure maintained by engine-driven pump through variable pressure valves, transmits pressure through oil directly to the hydraulic-actuated clutches. Engagement is smooth, precise. Operator has perfect feel of the load for effective work even though bucket is out of sight.

More usable horsepower

Size for size, Link-Belt Speeder shovel-cranes utilize more of the engines' available horsepower. This bonus pays off in added power at the bucket teeth, greater line pull plus extra power to swing, hoist and travel. Although it gets more usable power and line pull out of the same engines used in other shovel-cranes, a Link-Belt Speeder remains well within the engine manufacturers' recommended operating speeds.

power hydraulic controls

Self-compensating clutches

Hydraulic-actuated pistons automatically adjust for heat and normal lining wear. Hydraulic pressure is unaffected regardless of the distance the piston moves to engage clutch.

Adds an hour's output per shift! Independent-Swing-and-Travel, available on 11 models, eliminates shifting, saves 20-30 seconds each machine move. All operations are completely independent of each other.

It's time to compare . . . with

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls

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● Placement of concrete was by company-owned truck mixers working from a batch plant, one plant on each side of the river. A footing cap pour being made here. Note pier dowels at right.

● Piers were reaching the half way mark in their rise to 135 ft. maximum height at the time this picture was taken. Beam forms in place in foreground, part of the standardization program.

Pier Construction for Thruway Bridge Over the Hudson

By C. B. Molineaux

Project Manager, Johnson-Kiewit, Contractors, New York, New York

SIMPLICITY of architectural lines marks the piers and abutments for the Thruway bridge currently under construction over the Hudson River below Albany. This design is also one of the keys to the contractor's job planning. Pertinent details are given here covering the substructure contract, which involves an aggregation of concrete piers numbering among the highest in eastern U. S. highway bridge annals.

The bridge, a four-lane structure with a 13-ft. center mall, is on the Berkshire Section of the New York State Thruway, linking with the Massachusetts Turnpike leading to Boston. The 5,330-ft. structure will cross the Hudson at Castleton, ten miles below Albany. Its high-level, bluff-to-bluff roadway on level grade provides 135 ft. vertical channel clearance, as required for navigation. The bridge also passes high over the NYC main line tracks.

The substructure is being built by Johnson-Kiewit, a joint venture of the Arthur A. Johnson Corporation, New York, sponsor and Peter Kiewit Sons' Co., Omaha, Nebraska. The contract in the sum of approximately $5,800,000 was awarded in October, 1956. The pier job is to be completed during the present working season. The superstructure contract was awarded in 1956 to Harris Structural Steel Co., fabrication and erection contractors, of New York City.

The size of the substructure job can best be visualized, perhaps, by looking at a few of the principal quantities. Structure and tremie concrete will total 63,000 cu. yd.; reinforcing steel, 6,800,000 lb. Steel pipe piling (14 in.) will total 35,000 lin. ft. Several of the piers are to be founded directly on rock by means of open cofferdams.

The bridge comprises a 3-span continuous through cantilever truss system over the river, with spans 420-600-420 ft.; and forty 97'-6" steel deck continuous girder side spans, most of which are on the east side of the river. A contract requirement was that the work be carried on from both sides simultaneously to speed completion.

The pier bents, 42 in number, all have cylindrical uniform diameter columns. Columns rise to a maximum height of 135 ft. above top of footings, with numerous shafts exceeding 125 ft. The 3-span river system is carried on columns 14'6" in diameter (river piers) and 14'0" (anchor piers), piers being 72 ft. apart, center to center. Side span piers consist chiefly of piers of columns 8'0" in diameter. As exceptions, piers 2 and 41 have 7'0" diameter columns, and piers 1 and 42 next to the abutments, comprise three 5'0" diameter columns.

All piers are tied at the bottom with an 8 ft. thick footing or pile cap, and at the top by a heavy reinforced concrete column cap. All but five short piers near each end also include an intermediate reinforced concrete strut.

Foundations for piers and abutments are of four types, as will be outlined along with the methods used for each type.

1. Most of the land piers and the two abutments are carried on 14-in.

(Continued on page 84)

- *Pier construction for mile-long, high-level structure planned around steel forms designed for multiple re-use.*
- *Large spiral cages for column reinforcement fabricated on the site.*
- *Driving of 35,000 feet of pipe piles has been slowed by glacial gravel.*

Integral Flow Control Now Available In Larger Volume Vickers Vane Pumps

For power steering of vehicles with very heavy front axle loading

Assures Optimum Steering ...Simplifies and Reduces Cost of Installation

Flow control in hydraulic power steering circuits is necessary because power steering pumps vary in volume delivery according to engine speed. To assure adequate steering power while maneuvering in tight places, the pump must be chosen to provide ample volume at engine idle speed. The much greater flow at high speed, if not controlled, results in unsatisfactory and sometimes unstable steering performance. Further disadvantage is undue heating of the hydraulic fluid.

FIG. 1—Vickers Series V200 Vane Pump with integral flow control and relief valve. Available in 3 sizes with nominal rated capacities of 5, 8 and 11 gpm.* Controlled flow rates of all sizes are 2, 4, 6 and 7 gpm at relief valve setting of 750 or 1000 psi.

***Rating at 1200 rpm.**

An integral flow control valve for limiting flow to the steering device has always been a feature of the small Vickers Vane Type Pumps used in passenger car steering. Excess fluid resulting from higher engine speeds is returned to the reservoir with minimum pressure loss and very little heating. Previously, the larger pumps used for steering heavy vehicles did not have an integral flow control valve. It was installed as a separate unit.

Now Vickers offers larger pumps—the V200 Series—with integral flow control (See Fig. 1), which simplifies and substantially reduces the cost of installation. Smaller hydraulic lines to the steering booster are made possible by limiting flow in this part of the circuit.

For applications requiring two

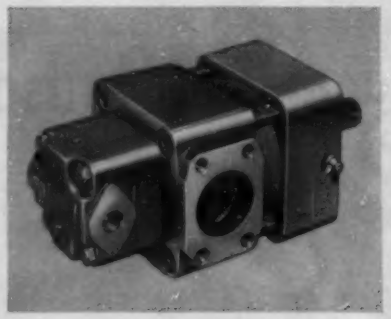

FIG. 2—Vickers Double Pump for operating two independent hydraulic circuits from one power source. Series V2200, V3200 and V4200 are available with the smaller pump (Series V200) having integral flow control for power steering.

separate hydraulic circuits, the Vickers line now includes three new series of double pumps (See Fig. 2). Integral flow control is furnished in the small-volume section used for power steering. The large-volume section, in conjunction with Vickers multiple unit valves is used for operating the vehicle's tools.

Both the single and double pumps with integral flow control have all the features and characteristics responsible for the outstanding popularity of Vickers Vane Type Pumps. Higher efficiency means more work from less power. Hydraulic balance eliminates pressure induced bearing loads, provides longer life and reduced maintenance. Automatic wear compensation maintains "new-pump" efficiency throughout a very long life. Starting in cold weather is easier.

More Vickers designed pumps than all other makes combined are used for hydraulic power steering. Ask for new installation drawings M192680, M192856, M192857, M192858 and #1617-S.

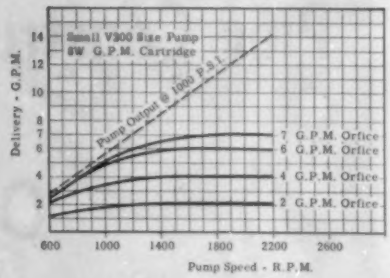

FIG. 3—Typical performance curves of Vickers V200 Pump with Integral Flow Control and 8 gpm cartridge. Delivery rises quickly with speed and then holds at controlled flow rate setting.

7777

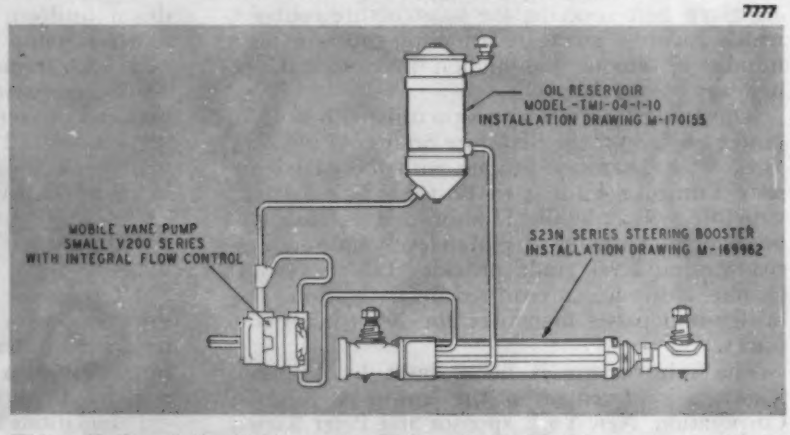

FIG. 4—Preferred circuit when using Vickers Series V200 Vane Pump with integral flow control and Vickers S23N Hydraulic Power Steering Booster. This model is without relief valve because the pump contains such a valve.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

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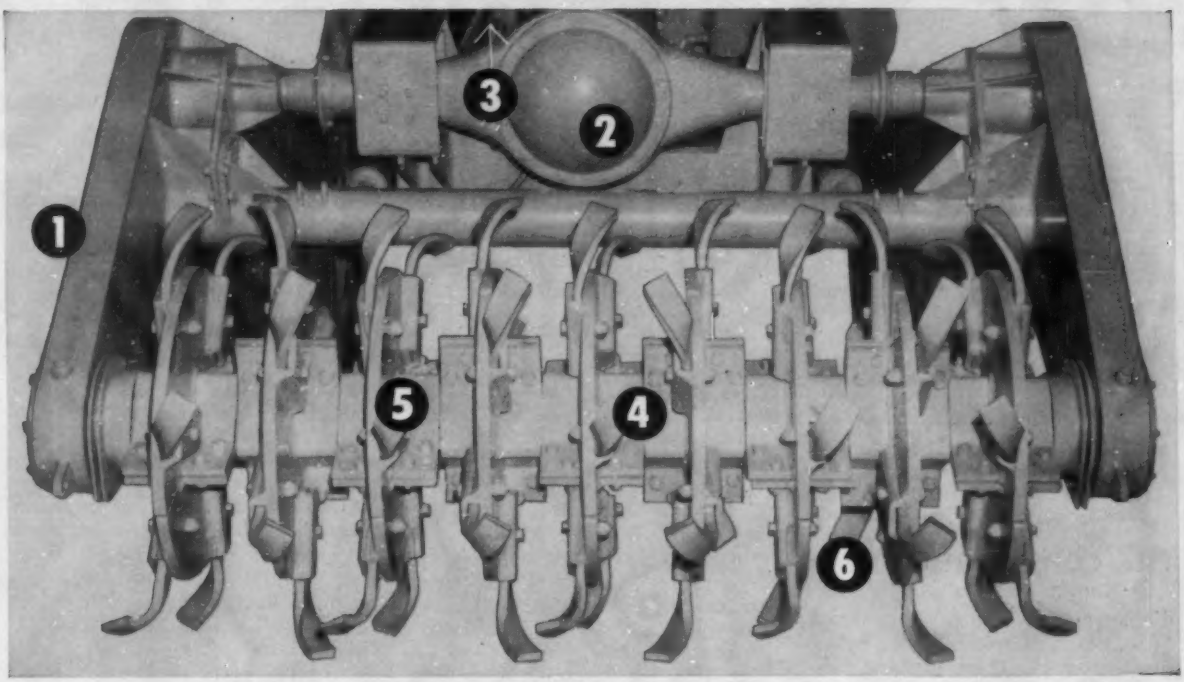
If you are doing Soil Stabilization work, you know why this design is so important



The BROS Roto-Mixer's performance during the past two construction seasons has been sometimes described as truly amazing. If you know in-place soil stabilization machines and jobs, as you review the design features below, you'll readily understand why.

CUTS MIXING TIME

1. Because drives are at outside ends of the rotor shaft, even mixing is accomplished in one pass. No need of a second pass to provide uniform mixing.

Full width mixing or any increment up to 7′ is easily handled. Split-disk type tool plates are quickly removed for shoulder maintenance or other narrow work.

2. Three-speed transmission and 150 usable HP at 1800 RPM provides a greater range of mixing speed . . . and mixing control which eliminates "surging" effect.

3. Independent hydraulic control of rotor and hood provide ample space for proper mixing to 12″ depths. Materials are uniformly blended in a smooth, even course.

CUTS MAINTENANCE COSTS

4. 6″ square solid steel rotor shaft easily withstands shocks and strains of in-place mixing of rocky soils.

5. Split-disk type tool plates are of heavy-duty construction; quickly and easily removed or remounted.

6. Simplified tool holders. Heavy-duty mixing tools are socket mounted, held by one bolt. Replacing worn tools is done in minutes.

You'll be glad to learn of the other important design and construction details of the Roto-Mixer. So see your nearest BROS Distributor for full information and a demonstration. Or write us today.

75TH YEAR BROS

Road Machinery Division

BROS *Incorporated*

(formerly Wm. Bros Boiler & Mfg. Co.)

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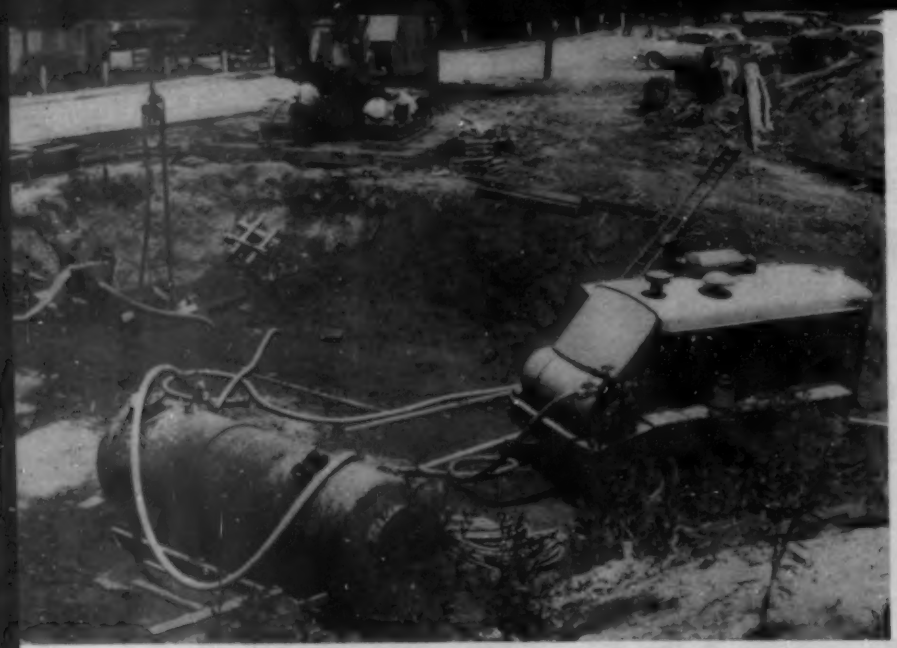


● **Work begun on typical footing—preliminary excavation completed, pile driving begun and jet cleaning of criven pile being done with blow pipe shown suspended from crane, supplied by 600 cfm compressor and receiver in foreground.**

PIER CONSTRUCTION

(Continued from page 81)

diameter steel pipe piles, made of ½-in. plate. These piles are being driven to rock, blown out and concrete filled. The usual procedure is to excavate about 8 ft. of soil, creating an open pit approximately at the bottom of the rectangular footing, which is typically 20 x 40 ft. by 8 ft. thick and heavily reinforced. Typical land piers have three rows of pipe piles totaling 8 battered and 6 plumb.

Driving of piles has been done using McKiernan-Terry S-8 steam hammers. After all piles for a pier are driven and cut off, a jet pipe suspended from a crane and supplied by air from two 600 cfm compressors is used to blow out the pipes. Each pile is immediately filled with concrete.

Jetting has not been easy in all cases, due to the presence of coarse glacial gravel in the valley clay. A well drill fitted with a large diameter bit on a cylindrical sleeve has been used successfully to chop out the gravel. Chop literally is the word for this operation, which has been a source of considerable trouble on this project. When the gravel has been sufficiently pulverized to be blown out, the jet pump then finishes the job.

Most pipe piles have been driven with open ends in lengths from 30 to 60 ft. as required to reach rock. However, for two piers at the east end, together with the east abutment, closed-end pipe was required due to irregular pockets in the underlying rock surface. Pipe lengths up to 90 ft. involving weld and sleeve splices were used at these locations.

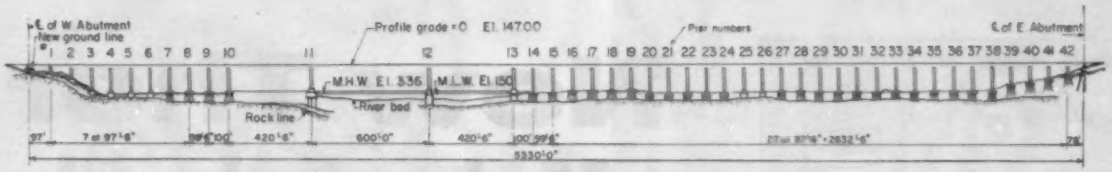
2. Concrete foundations to rock, poured in circular cofferdams, were constructed for five piers located at creek inlet channels. Here 24-ft. diameter circles of steel sheeting, one for each pier shaft, were driven to rock, blown out by jetting, tremie sealed, and concreted on up.

The rings for these cofferdams represent one of the numerous examples of construction equipment planned for multiple re-use. A total of 26 ring positions was required for the ten cofferdams. Rings of bent I-beams totaling 12 in number were purchased, each ring getting two or more uses. In driving the cofferdam, the sheeting was started, the first ring set on the ground, and the ring lowered progressively, with driving of sheeting never too far ahead as the hole was excavated by clamshell. By this means, the sheeting was successfully driven in a true enough position to permit the rings to fit accurately in their final position.

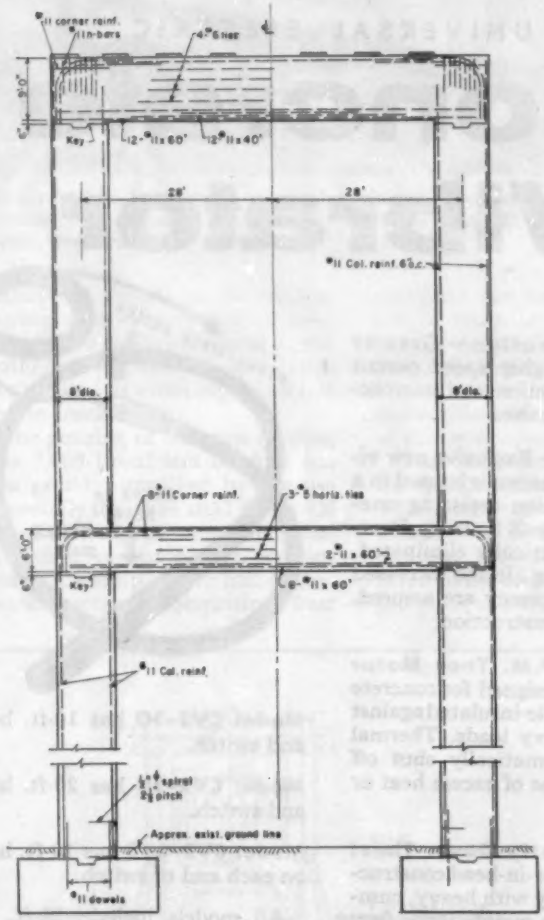
Jet-pumping of these cofferdams was done with a heavy compressor, accompanied by pumping in of water by a 6-cylinder centrifugal pump to maintain the pool height. Blowing was done intermittently to allow the remaining mud to settle, after which a final period of blowing left the pit clean enough for sealing.

The foundation concrete was then brought up and the final lift

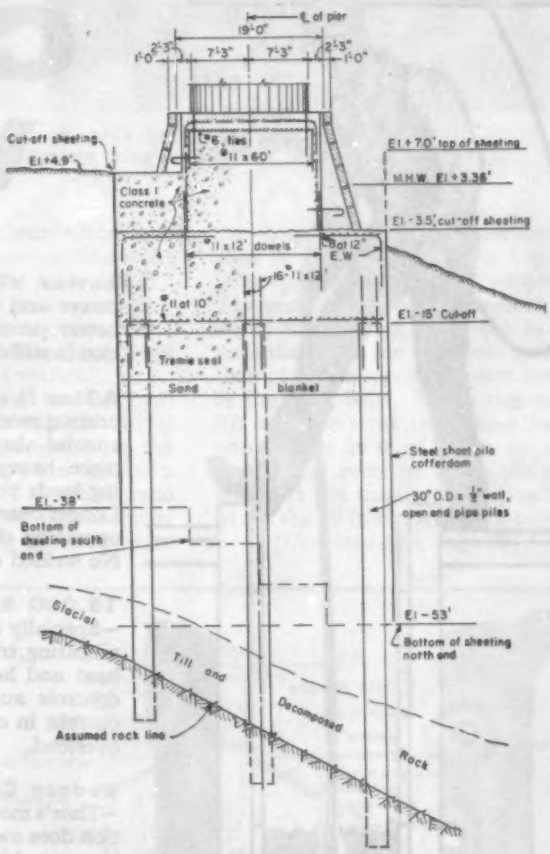
● **Steel pile shell has been driven and cleaned out and is being filled with concrete.**



● **Span scheme and type of foundation for piers for the Thruway bridge.**



● **Details of piers 2-8 and 12-39 inclusive, with 8'0" uniform diameter columns and standardized tie and cap beam.**



● **Pier No. 11, a special situation, required drilled-in piles due to slope of underlying rock surface.**

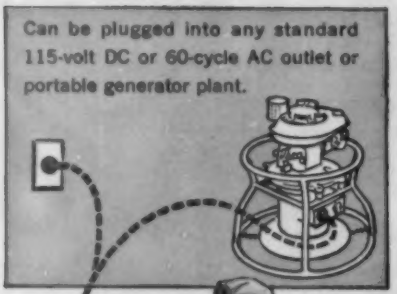
poured into conical wrought iron "ice breaker" rings, designed for ice and erosion protection.

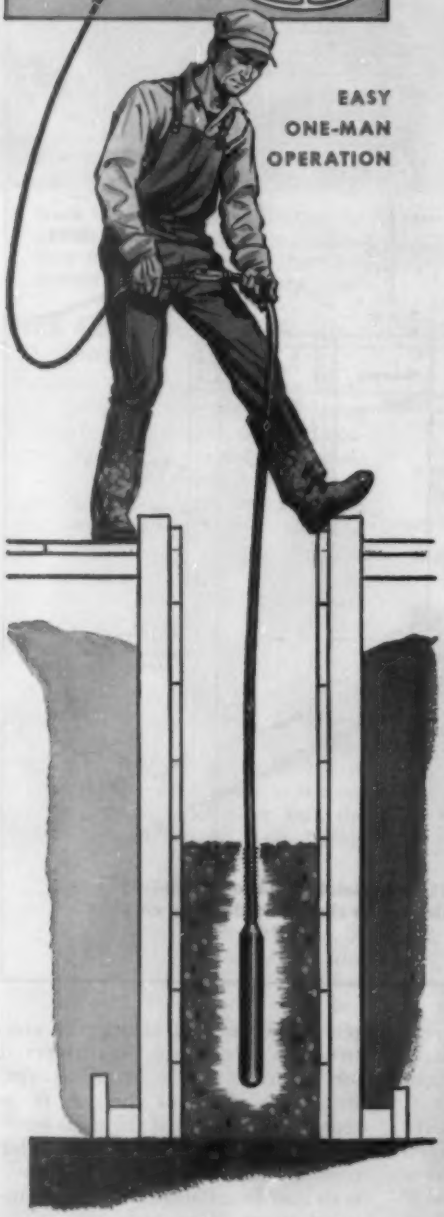
3. One pier foundation (pier 11) was constructed with drilled-in caissons, deemed necessary because of the sloping surface of the underlying rock. This pier is located at the water's edge and comprising one of the channel span piers; 26 30-in. diameter pipe piles driven to rock contact, after which they were cleaned out, the holes extended 5 ft. into rock, and each pile securely keyed prior to concreting by installing a heavy H-pile full length from top of pipe to bottom of hole.

4. The main river piers, Nos. 12 and 13, are being built in open cofferdam to rock, and will have foundation dimensions 32.1'x106.0' for pier 12 and 29.1'x101.1' for pier 13. These piers will be constructed from a timber trestle built out from the east shore.

In describing the design of the pier columns and struts, the construction procedure was reserved for separate review at this point, since this phase of the job is in many respects one of the most noteworthy parts of the project. Pier construction as well as the tremie seals and foundations has been supplied from two concrete batch plants, one on each side of the river. Concrete is dry-batched into truck mixers, of which Johnson-Kiewit has eight or nine working in

25% more power! Lower vibrating cost!





New Thor Motor-in-head

UNIVERSAL ELECTRIC

Concrete Vibrator

Better Vibration—Greater power and higher speed permit better penetration and compaction in stiffer mixes.

A Thor First—Exclusive new vibrating mechanism is housed in a special abrasion-resisting one-piece, heavy-wall housing. Bearing loads practically eliminated. Longer bearing life and increased operating efficiency are assured. No welded construction.

15,000 R.P.M. Thor Motor—Specially designed for concrete vibrating, triple-insulated against heat and heavy loads. Thermal controls automatically shut off current in case of excess heat or overload.

Reduce Costly Down Time!—Thor's motor-in-head construction does away with heavy, cumbersome, high-maintenance flexible shafts—permits easy one-man operation.

Streamlined Submersible Switch—Can't catch on reinforcing metal because it's round, smooth, and tapered to hose diameter, concrete-proof and moisture-proof. Special operating hose is neoprene-covered and neoprene-lined to resist oil, grease, and gasoline. Flexible, easy to maneuver on forms.

Model CV2-10 has 10-ft. hose and switch.

Model CV2-20 has 20-ft. hose and switch.

Model CV2-210 has 10-ft. hose on each end of switch.

All models include 25-ft. 3-conductor electric cable. Ask your Thor distributor for a free demonstration. Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

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PORTABLE POWER
TOOLS

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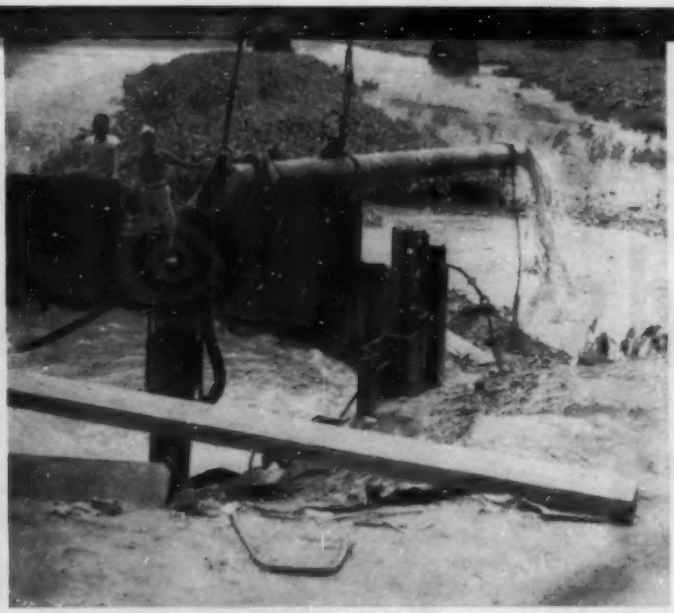


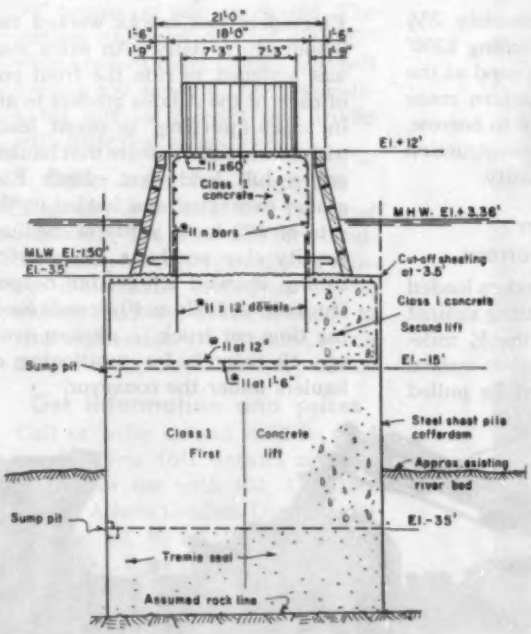
● **Several piers are carried on circular concrete foundations to rock, built by driving sheetings, braced with circular I-beam rings. (See right). At left is a cofferdam being air-jetted to remove mud, preparatory to sealing.**

a continual shuttle to the various pouring sites. Heavy timber mats used also for crane operation in wet weather or at marshy sites have been spotted as dumping platforms for the truck mixers.

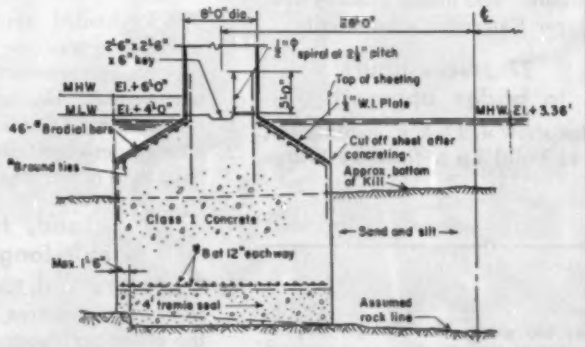
The pouring of columns totaling some 7,000 lineal feet of shaft has been greatly simplified by the use of specially designed steel forms. Of Blaw-Knox design and manufacture, these consist of 5-ft. sections usually made up of two half-circles. Special sections comprising four segments are required where the cap or beam or intermediate strut joins with the shafts. A total of 392 lineal feet of such forms was purchased, comprising 78 sections. The forms thus will receive an average of nearly a score of re-uses.

The form sections are designed for quick bolting and unbolting. The pattern of use is geared to the location of construction joints, a location diagram for which was given to the engineers for the entire job prior to starting the work. Since the intermediate strut for most piers is about 60 ft. up, a logical joint spacing of 20 ft. was adopted. The general procedure has been to set 20 ft. of forms, make the pour, raise the forms for two more pours, then place the special column forms at the strut level. When the strut lift and the strut itself have been poured, the 20 ft. of forms are unbolted and reset on up to the cap pour. It has usually been possible to lift the 20 ft. of forms in a bolted

(Continued on page 90)



● **Foundation for Piers 4, 5, 6, 25 and 26 (at creek inlet locations) consisted of 24.2-ft diameter circular footings, one under each pier column, constructed in sheet steel cofferdam.**



● **Details of foundation for Pier 12 out in the River. Built in open cofferdam.**

Excavate and load

600,000 yds.

with 2 graders

J. D. & P., Inc. equips 2 "660's" with ELEGRADERS

Johnson, Drake, and Piper, Inc. faced the problem of moving 600,000 yards of dirt 3½ miles over city streets in suburban Buffalo, for a new section of New York Thruway. Contractor found the solution in hauling by truck... digging and loading clay material with two 150 hp Adams* 660 motor graders with outrigger Elegrader attachments.

27 trucks haul to bridge approach

Photos show J. D. & P. loading out dirt to build up a thruway bridge approach. 27 sideboarded 10-yard dump trucks each hauled 12-yard loads over city streets to the fill. Two dozers, a sheep's foot roller, and a 50-ton pneumatic roller, spread and compacted the dirt. At the borrow, a grader bladed off-highway haul roads and maintained the pit.

Trucks hauled approximately 3½ miles (one way) — including 1200' over rough construction sand at the borrow exit. Haulers' return route included a 500' entrance to borrow, over grader-maintained construction haul road of average quality.

Loads from ¾ mile-long borrow

Two "660's" with Elegraders loaded trucks in a flat area, cutting against the outer perimeter of the ¾ mile-long borrow. The two loaders worked in tandem. Empty trucks pulled under the conveyor of whichever unit was available. On this stripping operation, there was very little truck waiting time — in fact, Elegraders could have kept more trucks busy on the lengthy 3½ mile haul.

Strips clay @ 460 yds. per hour

Elegraders and trucks worked two 8-hour shifts daily. An extra man was assigned to ride the front end of each of the Adams graders to aid in truck-spotting, to count loads with timer, and to assure that haulers got a full load, fast. Each Elegrader excavated and loaded at the rate of 460 loose yards of medium density clay per hour. Stop-watch timing showed Elegrader heaped trucks in as little as 40 seconds loading time per truck... plus an average 10 seconds for positioning of haulers under the conveyor.

Adams 660 grader with outrigger Elegrader strips 18" of clay fill along perimeter of ¾ mile-long borrow. With 2 Elegraders, Johnson, Drake, and Piper, Inc. excavated and loaded-out 600,000 yards for New York Thruway extension in suburban Buffalo.

Elegrader's 32" disc plow cuts and feeds continuous ribbon of clay material onto fast-moving, trough-type belt conveyor. Although loading was limited to 41.2 minutes hourly (by the rate at which trucks could return from the 3½ mile haul), Adams 660 with Elegrader loaded 460 loose yards per hour into trucks on J. D. & P. job.

Cut 18" deep at 2.3 to 3.3 mph

As the LeTourneau-Westinghouse grader moved forward in 1st or 2nd gear, Elegrader's 32" disc plow "peeled off" strips of almost-dry clay averaging 18" deep. On the first slice, cut-depth sometimes reached 30" because of uneven ground. The endless ribbon of dirt fed onto 42" wide, grader-driven, trough-type belt moving 450' per min. Conveyor elevated dirt to overcast into trucks with little dust or spillage.

Other uses for Elegrader

Elegrader is a useful tool for other roadwork. It's often used on secondary roads, for cutting roadside drainage ditches and casting up dirt to elevate roadway. If it's desirable to haul material for fill or waste, it can be loaded into trucks moving parallel.

Get information and prices

Call or write us and we'll be glad to give you full details on Elegrader for use with 104, 123, 150, 190 hp Adams Graders. Other grader models: 60, 80 hp. Information is FREE . . . there's no obligation.

*Trademark AE-1254-H-6

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

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PIER CONSTRUCTION

(Continued from page 87)

string using a single crane.

The top form section on each 20-ft. string has a scaffold from which workers can operate with safety to trip the 2-yard drop bucket and handle the vibrators. A simpler scaffold is mounted on the lower end of each 20 ft. form lift, from which unbolting is done.

Still another example of adoption of the repetitive principle is the design of the forms for the intermediate struts and cap beams. These forms, also by Blaw-Knox, consist of side panels and a bottom panel of angle-stiffened steel, designed for easy bolting and unbolting. Three sets of forms were purchased for cap beams and three for the somewhat shallower intermediate struts; each set will be used eight or nine times. The sets are so designed that combinations can be used to form the deeper beams.

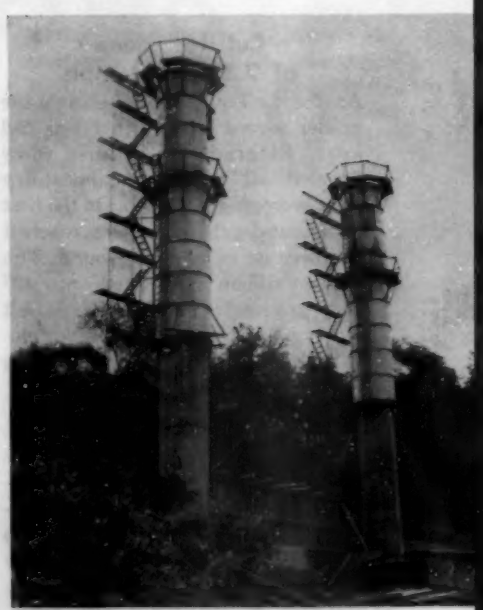
The forms are assembled on blocking at the base of the pier and raised by a single crane.

Aiding in all this form setting and dismantling, is the use of tubular steel building scaffolding, one frame being set up beside each pier shaft and bolted to the forms. The scaffolding serves as support for safety stairs and work platforms at different levels.

The beams are massive affairs in some instances. The largest, capping piers 12 and 13 in the river, are 14'6" deep by 8'6" wide and with the pier lift at each end, will each require a continuous pour of about 470 cu. yd., working 135 ft. in the air.

All pier work including handling of forms, reinforcing, scaffolding and miscellaneous lifting is done with cranes working on the ground. Fifteen cranes, some crawler and some truck-mounted, have been required from the outset. Booms range from 70 to 150 ft. During the early months no jibs were used, but it is expected that jibs will be required for the highest pours.

● **Pier at far west end, showing footings at different heights. Also one of several variations in the use of tubular steel scaffolding and safety stairs. Two standardized form panels joined to form extra height cap beams. 7 ft. diameter column forms used to pour 5 ft. diameter columns by special adaptation shown.**



● **Showing two strings of 5 ft. form sections in place with two types of scaffolding used as standard and still another variation in the use of tubular building and scaffolding.**

● **One of the two batch plants which are supplying the 35,000 cu. yd. of concrete needed for the Hudson River Bridge.**

Another point of considerable interest is the pier reinforcing. Ordinarily for piers of 8 ft. and larger diameter, rings are used for circumferential reinforcing. These piers utilize spirals, believed to be of record or near-record size. Spirals are fabricated on the site by August

"D" replaces 4 machines

on grading job for city of Saskatoon

Grading foundations for sidewalk and curbing in the city of Saskatoon, Saskatchewan, Canada, was once a 4-unit, 4-man job for Saskatoon Contracting Company, Ltd. A tractor-loader excavated and loaded material into two trucks. A dozer spread dumped loads at the fill.

Saskatoon Contracting replaced this fleet of machinery with a single dozer-equipped LeTourneau-Westinghouse D Tournapull. This easy-to-handle rubber-tired scraper self-loads, cutting to grade. It carries excavated material to fill area, where it spreads load in controlled layers and levels fill as needed with its dozer blade.

Concrete-pouring crews follow in Tournapull's accurately-graded paving areas. They set up forms, and lay new sidewalk and curb at the rate of 700′ to 1000′ per day.

Operator uses "D's" dozer blade to cut bank at loading site. Tournapull then self-loads the loose material for spreading at the fill.

Took 200′ cut on each load

In excavating for the new sidewalk base, "D" took thin cuts over a 200′ distance in 1 min. 35 sec. Using Tournapull's precision electric controls, operator was able to cut and grade to exact specifications. Little finish-grading was needed before concrete was poured.

Haul — down a paved road to a low area needing fill — measured 225′. Average haul time was 29 seconds. Here the operator used "D's" dozer blade to push previously dumped load over fill edge. He then dumped his load and backed over it to return to cut. Return to the load area took 34 sec. Average time for the 850′ cycle was 3 min. 16 sec.

Work range surprises customers

Saskatoon Contracting, according to Peter Prescesky, one of the company officials, is well pleased with its "D". "We find it can do many jobs that we and our customers had no idea it could handle," he said. "Wherever we have used it," he added, "customers have been pleased with its economy and the quality of work done."

Saskatoon Contracting recently purchased a second D Tournapull to expand its range of operations. The firm handles considerable construction work for local industries as well as municipal contracts.

New "D" capacity 9 cu. yds.

With its heaped capacity of 9 cu. yds., the recently improved D Tournapull can move big yardage on production work — yet has the compact size and maneuverability necessary for hard-to-get-at clean-up jobs. Width of only 8′, and weight distribution of less than 9 tons per axle, allow contractor to road it without permit. On job-to-job moves, it speeds up to 29.5 mph.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-1213-MU-b

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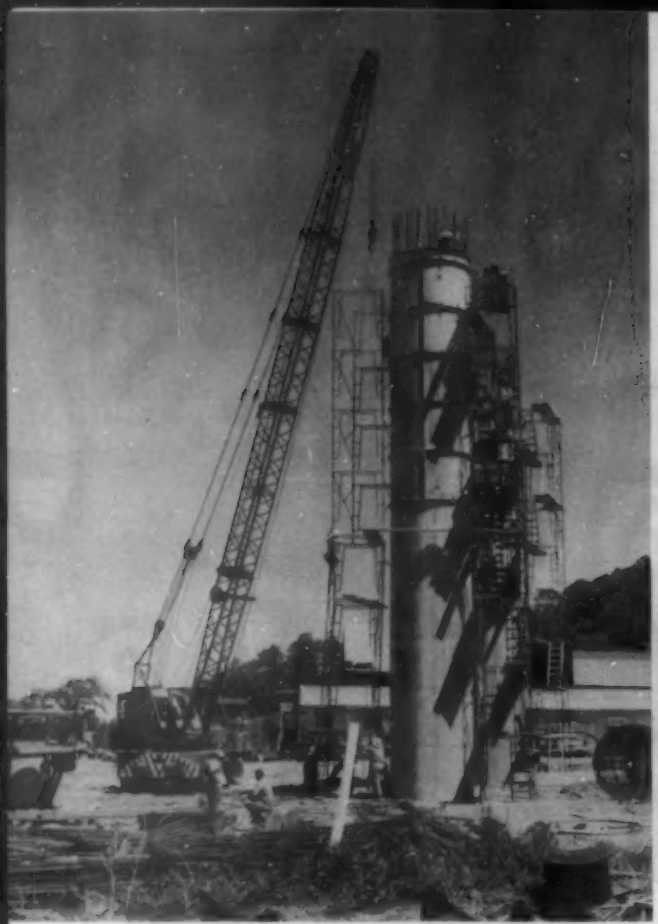


● **Cranes with long booms were the key to job planning on this bridge. (Left): Handling scaffolding, a constant operation as work progressed. (Right): Setting the heavy steel forms for an intermediate beam.**

Brassard Steel Erector, Inc., of Central Falls, R. I., which has a subcontract for all reinforcing steel. Spiral cages usually 30 ft. long are spun from ½-in. steel furnished in reels. The cages are turned out by a special apparatus, tack welded using current from three portable welders, moved by trailer to the pier position, and set by crane.

The spirals have a pitch varying from 2¼ in. for the largest river piers to 3 in. for the 8 ft. piers.

Vertical reinforcing for all piers consists of No. 11 bars, 46 per shaft for the 8 ft. diameter and up to 120 bars for the 14½ ft. diameter river pier columns. Footing dowels are set accurately by means of a wood template frame.

Concreting of piers is expected to progress steadily throughout the 1957 season at the rate of about 350 cu. yd. or more per day. The longest day's run, to date, was a 660 cu. yd. pour, which required 13 hours and involved a number of simultaneous pouring locations.

Madigan-Hyland, consulting engineers, Long Island City, New York, designed the bridge and are supervising construction for the New York State Thruway Authority, T. Cheeger being chief consultant and Harold Knox, resident engineer for the consultants.

● **An excellent view showing piers in all stages of construction in the beginning phase of the job. Note record sized reinforcing cage.**

. . . for more details circle 278 on enclosed return postal card

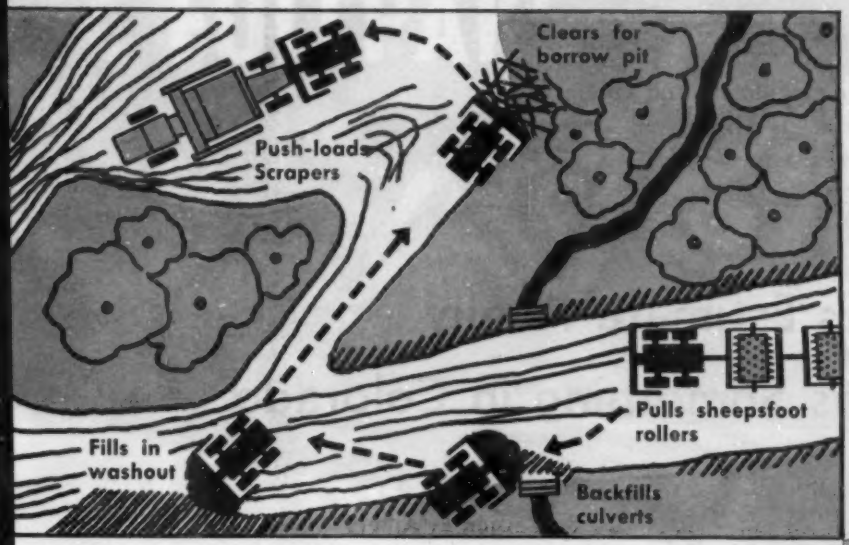
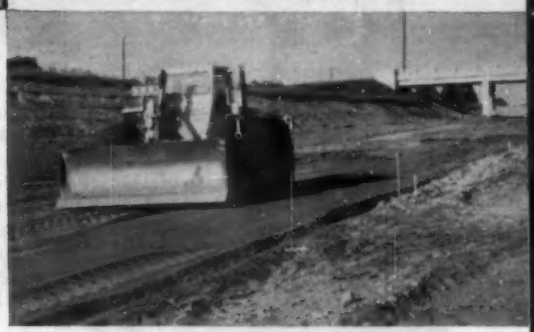


Diagram shows some of the many ways you can use Tournatractor's speed and mobility on your spread. Fast-moving tractor hustles back and forth between scattered assignments with minimum time lost travelling. In less than 4 minutes this 17 mph rig can be at work on a new task a mile away. It can easily handle 9 scattered one-hour assignments, averaging a mile apart, in a single 10-hour day.

Carl Goodwin & Sons, Allegan, Mich., needed a fast, mobile tractor to handle scattered dozing, towing, and pushing on a million-yd. Detroit to Chicago expressway job. This $2,000,000 project called for 8 miles of 200' wide right-of-way with bridges and culverts. Goodwin bought a Tournatractor to fill his needs, because this machine gets into an area fast, does a job, and moves on to the next assignment without delay.

Photo shows rubber-tired Tournatractor backblading as it compacts fill. Versatile, fast-moving rig also graded, backfilled culverts, and push-loaded scrapers. Other equipment on job included 9 C Tournapull scrapers, a crawler-pusher, and a crawler-scraper team.



Why EVERY spread needs at least one high-speed TROUBLE-SHOOTER

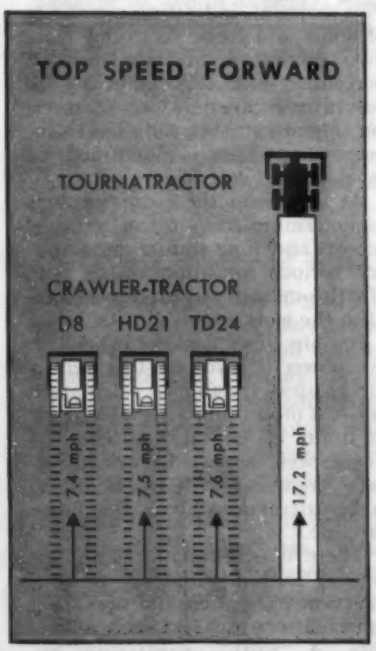


Chart shows rubber-tired tractor's travel-speed advantage. Tournatractor is over *twice as fast* as 3 leading crawler-tractors in its size range.

To keep up with today's stepped-up dirt-moving schedules, you need faster, more mobile equipment. A careful analysis of your jobs — especially large-volume contracts — will show the need for rubber-tired tractors to handle the hundred-and-one scattered dozing, pushing, and pulling assignments on your spread. If you now use 100% crawlers, you should try at least one rubber-tired dozer NOW for the high speed assignments. Then analyze the extra profits it brings!

Cut your costs on "hit-and-run" jobs

Fast-moving, LeTourneau-Westinghouse 210 hp C Tournatractor® — with its travel speeds to 17.2 mph — gives you the perfect tool for "hit-and-run" tractor jobs. For example, whenever bottlenecks develop, anywhere on your spread, you can capitalize on Tournatractor's speed by dispatching this roving trouble-shooter wherever needed — to accelerate clearing, speed-up push-loading on short hauls, level fills, backfill culverts, fill in wash-outs, pull sheepsfoot rollers, rooters, etc.

Think, also, *of the time you save* over the slow, cumbersome crawler method or job-to-job moves! With Tournatractor there's no moving in of truck and trailer, no loading and unloading, no extra manpower or expense. Operator just gets on and GOES.

Rubber best for scattered assignments, longer work cycles

Analyze your jobs. Then choose the equipment that will do the best job for you — with least time and expense. Where your work calls for maximum lugging power in limited-area operations, you need crawlers. But where you have *scattered operations, long cycles,* and *frequent moves,* Tournatractor's rubber-tired speed and mobility really pay off!

With larger yardage, bigger area jobs ahead, it will pay you to investigate the improved rubber-tired Tournatractor — product of 10 years of field experience all around the globe. Ask for a demonstration . . . see how this versatile rig can fit profitably into *your* busy dirtmoving schedule!

CT-1270-H-b

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Labor and other manpower cost elements are the chief "variable" in a procedure which has eliminated dependence on past bid prices in estimating.

The Engineers Estimate Really Means Something in Colorado

By Vernon L. Albers

Supervisor, Costs Estimates Unit, Colorado Department of Highways, Denver

For the past seven years, estimates of construction costs made in the Colorado department of highways have been coming closer to exact coincidence with the figures of the winning contract bids.

In the calendar year 1956, the department's three-man Cost Estimates unit, consisting of Daniel D. Rustemeyer, Earl L. Huff and the writer, made construction cost predictions on over 98 percent of the department's 93 biddings for that period. The award bid total was $30,442,359 and the estimate total was only three-tenths of one percent less than that.

When it was started nine years ago, the Cost Estimates unit worked on much smaller percentages of smaller construction budgets. In 1951, estimates were prepared on 55 percent of the department's projects, for which the award amount was $12,706,121. The estimate total was 5.7 percent below that sum. In 1953, the unit's totals were 4.05 percent above the award total for 69 percent of the year's projects, $20,456,591. In 1955, its work had expanded to cover nearly 94 percent of projects and the estimates were 1.5 percent below the award total of $20,744,576.

Before 1948 and the activation of this unit, only a small percentage of Colorado state highway projects were estimated. The method followed by squad and floor leaders in the roadway plans section was the loose one of applying unit costs based either on individual judgment, past bid prices or averages of these prices.

The first job of the Cost Estimates unit, as set up under the direction of Adolph Zulian, surveys and plans division engineer, and Thurlow C. Reseigh, roadway plans section engineer, was to start equipment literature files and undertake detailed investigations of individual, major items in the department's projects. In trying to arrive at reasonably contemporary unit prices for each item, the Colorado department now has definitely rid itself of making cost estimates from previously bid averages.

These previous averages do not provide a reliable index of prognostication because they are often distorted by unbalanced or erratic bidding from more than one of the contractors.

An example of the present method of price investigation is that for unclassified excavation, which is of major importance on many projects. First, the department's materials division supplies our roadway design section with a "soil profile report" which indicates types of soil encountered by drilling and testing of materials along a project's centerline.

The design engineer then supplies our cost estimators with a complete breakdown of the excavation material, indicating quantities of solid and loose rock and common excavation and the over–all percentage of rock. Quantities involved in excavation for structures, cut slope treatment, subsidence and borrow materials are identified for separate unit costs.

At this point the estimator tries to determine from manufacturers' reports and time studies, made under various conditions, what type of equipment is required to accomplish the work involved.

In any calculation in which manpower is involved, this item is the greatest variable in calculation but it is most often a variable within limits of known, ordinary circumstances. Knowledge of contractor's organization enables us to make calculations about this labor variable.

There is a difference in the efficiency and organization of construction companies and operating contractors which is very noticeable. A "weak" organization apparently results in quickly unserviceable equipment, low employee morale and consequent small profit. Good key personnel in a "strong" organization may

(Continued on Page 96)

● **In the estimating section: Thurlow C. Reseigh, roadway plans engineer listens as Vernon L. Albers, center, supervisor and estimator, explains a calculation. Daniel D. Rustemeyer, estimator, is working in the background.**

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C FULLPAKS' 4th gear haul-spread-return speeds Minnesota road job

High work speed of two LeTourneau-Westinghouse 18-yd. Fullpaks has helped R&K Contractors, Inc., Fargo, N.D., get back on schedule with a Minnesota highway rebuilding job — delayed for a month by bad weather. R&K's scraper fleet included 2 C Fullpaks and 2 older C Tournapulls of 16 yd. capacity.

16" of rain in 32 days

Work was delayed by heavy rains (total of 16" fell in 32 days). When operations finally started, speed was essential. The firm's contract called for moving 350,000 yds. on 9 mi. of Minnesota Highway 32, between Middle River and Strathcona. All old sub-base material was to be removed and replaced with a sand and gravel mixture.

4th gear on most of cycle

On one 4300' cycle, the 18-yd. "C's" averaged 4 min. 36 sec. They hauled, spread in thin layers, and returned — all in 4th gear. The only 4th gear exception (aside from loading) was for the few seconds it took to make a sharp 180° turn after spreading, when operators shifted to 3rd.

"You can dump 'Pulls in a higher gear than with other rigs," stated Herb Reese, Jr., a partner in the firm. "The new constant-voltage transformer makes it easy to control the machine when you throttle down. Also, visibility is very good."

"Load in half the time"

"In loading, too, you can't beat the Fullpak," Mr. Reese added. "They'll load in half the time it took with older models."

Gilbert Kranz, Reese's partner agreed that the new "C" loads fine. "That quick release for pumping gets better loads in sand," he said. "You get around easier with these scrapers, because their total weight is better distributed."

90% efficient for 5 years

The firm looks forward to low maintenance costs with its new Fullpaks, because of the excellent maintenance records of its 5-year old 'Pulls. Their job efficiency since purchase is rated at more than 90%. 5 of the 8 tires on these older rigs are factory-mounted originals.

Get facts and compare

Make it a point to see the new Fullpak at work in your area. Write for full specifications. Compare — and you'll see that this high-production rig offers you more dependable work power, per dollar of investment, than any other scraper now available.

Spreading on the run in 4th gear, at an average speed of 12.6 mph, one of R&K Contractors' C Fullpaks lays a thin sub-base of sand and gravel over a 200' stretch. With haul, spread, and return in 4th gear, these new "C's" completed a 4300' cycle in only 4 min. 36 sec.

Partners Herb Reese, Jr., and Gib Kranz agree: "You can't beat the new C 'Pull for loading." New design of bowl permits easier, faster loading. Material packs well into corners. Positive ejection discharges load completely.

Only slowdown in the fast 4th gear haul-spread-and-return of R&K's Fullpaks occurs as scraper drops to 3rd for the few seconds it takes to make a tight 180° turn in roadway. "C" shifts to 4th again, for return.

Tournapull—Trademark Reg. U.S. Pat. Off. CP-1244-H-b Fullpak—Trademark

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ENGINEER'S ESTIMATE

(Continued from page 94)

create more profits than any other condition over a given period.

Our Cost Estimates unit develops an approximate cost for an operation by application of current equipment rental rates and labor scales. To this, from 10 to 25 per cent is added for contractor's profit and overhead to obtain the final predicted unit price.

When we discover a great variation in operational costs of different types of equipment likely to be used, we do quite often apply a midpoint or average cost in order to arrive at an estimate that will be of equal benefit to both large and small contractors.

Special Forms

Efficiency of the unit's work has been increased by the formulation of 15 special unit forms, some of which are adaptable to as many as six distinct items. Trained use of these forms has greatly reduced time required for the tasks of the unit and has increased the work accomplished during the past decade. The department's road budgets are doubling and reaching into the $60-million bracket as our expanded federal road program gets started.

As background for the making of detailed and separate investigations of the challenge presented by each separate project, we have developed a Cardex "memory" file containing data drawn from every possible source on equipment capacities, labor rates, time studies and notes on new types of equipment and construction methods. With the aid of this "memory," or summary, of our bulky work sheets, we try on the next possible occasion to adjust our estimating of certain items that we know have repeatedly been estimated within reason, but not as accurately as we desire.

C.D.O.H. Design Aid No. 14-A
March 7, 1955

Cost Analysis-Unclassified Excavation
Project No. _____
Location _____
Date _____
Sheet No. _____

COST ANALYSIS OF UNCLASSIFIED EXCAVATION

STATION	Total Quantity Cu. Yds.	COMMON %	COMMON Quantity	SOLID ROCK %	SOLID ROCK Quantity	LOOSE ROCK %	LOOSE ROCK Quantity
TOTALS:							

SUMMARY:

_____ Cu. Yds. Common @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. Solid Rock @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. Loose Rock @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. Structure List @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. Cut Slope Treatment @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. Borrow @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. _____ @ _____ per Cu. Yd. = $_____
_____ Cu. Yds. _____ @ _____ per Cu. Yd. = $_____
Cost of Moving In and Out - - - - - - - - - - - - - - - - - - = $_____

TOTALS: _____ Cu. Yds. $_____

Average estimated cost _____ = $_____ per Cu. Yd.

Use $_____ per Cu. Yd.

Estimated per cent of rock _____ = _____ %

● **One of several forms developed for estimating highway work.**

An extremely high accuracy is required for the six to eight specific major items which often account for over 80 percent of total project cost—when 30 or more items are involved in a project.

Contrary to some indications elsewhere that contractors are competitively "leveling off" in their bidding, we have noted in Colorado areas of rapid economic development which have stimulated construction up to "booms" equivalent to any experienced nationally since 1945. Uranium developments, the building of the $66-million Air Force academy at Cathedral Rock, extensive Bureau of Reclamation work and the state's present $900-million to $1-billion highway program set up by the new Federal Aid Act—these have been maintaining a stable construction market, with little indication of downward trends since the early part of the Korean war in 1950.

The Colorado department of highways has experienced healthy bidding on projects of all sizes, from a few under $50,000 to a growing number of jobs involving over $1 million. The average num-

(Continued on page 98)

Recent Major Cost Items, Colorado Highway Work

		1956		1st. Qtr. 1957	
ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	QUANTITY	UNIT COST
Unclassified Excavation	Cu. Yd.	12,670,250	$0.346	3,396,800	$0.223
Gravel or Crushed Rock Surfacing (Std. Gr. C.)	Ton	1,103,010	0.864	231,000	0.821
Plant Mixed Asph. Surfcg.	Ton	915,720	3.130	92,670	3.494
Class "A" Concrete	Cu. Yd.	36,432	59.225	22,092	53.322
Reinforcing Steel	Lb.	5,579,600	0.133	3,614,538	0.132
Structural Steel	Lb.	4,552,000	0.188	2,916,967	0.199

Need big loading capacity?...instant mobility?

Work-and-run TraveLoader cuts truck-loading costs... loads aggregates, loose dirt, topsoil, to 600 yds./hr.

TraveLoader can efficiently work all day at a single location, loading trucks one after the other... or it can quickly maneuver and "run" between loadings at 26.7 mph, handling many scattered assignments in a day's time.

If you handle big yardages of gravel, crushed stone, sand, slag, topsoil, or surplus dirt, you'll reduce your truck-loading costs with an Adams* TraveLoader that will load up to 600 yds./hr., depending upon materials. And when loading from scattered stockpiles or loose materials beds, 26.7 mph TraveLoader loads fast and economically ... saves extra time and money by cutting expensive work-stopping delay in moving.

Truck-a-minute loading

LeTourneau-Westinghouse-built TraveLoader gathers and loads all kinds of loose, granular materials from stockpiles... from windrows formed by graders... from natural banks. It heaps trucks evenly and fast... continuously discharges full load of material off belt running at 450′ per minute. With a 40 to 60-second truck-loading cycle, TraveLoader handles big jobs fast... keeps work projects on schedule... cuts truck waiting-time... holds your loading and hauling cost low.

Loads in continuous motion

Unlike front-end loaders, TraveLoader works without wearing turns, back-ups, or other waste motion... does not need to push against a solid pile to load cleanly. Loader can move forward at any of 5 working speeds (25 ft. to 167 ft. per min.)... can adjust feeder to suit slope of shoulder. Machine gathers and conveys material from any width up to 8′, and discharges evenly into trucks. Conveyor is hydraulically adjustable to best truck height, for minimum spillage and dust-blow.

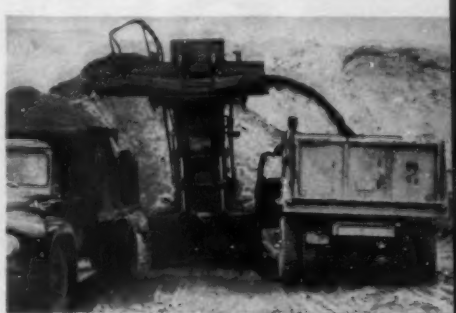
Rear or side delivery

Standard TraveLoader conveys material to the rear... loads on road shoulders, in one lane, over backfilled excavation, almost anywhere ... minimizes obstruction to traffic. With addition of reversible cross-conveyor (optional), it loads parallel trucks at either or both sides — fast as haulers can position.

Handles many jobs in one day

Rubber-tired TraveLoader has 5 travel speeds, moves quickly from job to job at speeds to 26.7 mph... from windrow, to stockpile, to bank work. Positive, convenient controls make loading simple, make maneuvering and traveling as safe and easy as driving a truck. Choice of diesel or gasoline engine. Machine weight approximately 16,700 lbs.

We'll be happy to send you complete information and names of users working TraveLoader on loading projects similar to yours.



Cross-conveyor (optional), shiftable left and right, directs material to trucks at either side ... speeds loading, cuts positioning time, balances load... boosts haul-trips per day.

*Trademark TL-1462-DC-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

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ENGINEER'S ESTIMATE

(Continued from page 96)

ber of bidders in 1956 was 10 and this number does not seem to be decreasing during 1957.

The department has been exposed to the difficulty of estimating on construction in urban areas for projects such as our Denver Valley highway, Pueblo and Colorado Springs freeways.

The Valley highway is marked across Denver from north to southeast and has been under construction since materials became available after World War II. Its right of way crosses all types of residential, industrial and business improvements in a growing city. The location was even improved by river channel changes and railroad relocations.

This type of project has many more items than usual that demand detailed investigation—i.e., traffic on haul routes, underground utilities, contractors' permits, and contractors' equipment subject to damage from vandalism.

But even "out state," Colorado's variety of terrain, from flat plain to craggy mountain passes, gives the estimators plenty of "unusual cases."

The department's staff engineers are men who have worked through the field districts or who have obtained considerable knowledge of Colorado before coming to Denver and acquiring the "urban" view. On the variability of our estimates, at least, we have not become embroiled in the "country boy vs. city feller" controversy, either within the department or in relations with the contractors.

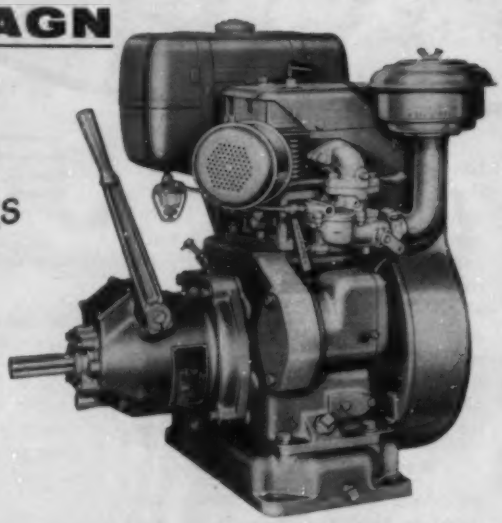
Salary Problems

As with other states, we have had difficulty obtaining competitive salaries for technical personnel from the state legislature, although we do have a classified merit civil service system and are "hatched" out of politics. (Under the Hatch act, the department's employees are prohibited from active participation in political organizations, since we receive federal aid.) In the present changing times and as we face, even in a comparatively low-salaried area, the recruiting of active contracting firms and other state highway departments, our organization is dependent on long-winded whip-sawing in the General Assembly for salary adjustments. Administratively, a provision for flexible salaries geared to living cost indices would be of great value in maintaining the men we have been able to hire and train for highway engineering work and like cost estimating.

Although the effect of our many investigations and analyses of highway construction costs is increasingly more apparent, we know that the work must be kept up and improved if we are to the job for which the Colorado department of highways set up its Cost Estimates unit.

I remember that an older, wiser engineer told me, several years ago, "getting a perfect estimate is like getting into the bull on a target. You may have put some shots into the 5 or 6 rings and a few in or near the bullseye. But remember that, by proper adjustment, you can bring your outlying shots intc the center too." On the range we're shooting, you have to keep adjusting for windage and elevation.

A NEW, BIG, 4-Cycle
Single Cylinder Air-Cooled Engine...
the WISCONSIN 12½ hp.
MODEL AGN
by Engine Specialists



Model AGN Engine with Clutch Assembly. Also available with stub shaft or with Reduction, Clutch Reduction and/or Electric Starting

• It takes full-time engine "know-how" and full-scale engine manufacturing *concentration* to design and produce engines of outstanding character *and* Performance Ability.

The new Wisconsin Model AGN 12½ hp. engine is the product of this unbeatable combination. *Engine specialists designed it. Engine specialists are building it.*

Putting 12½ hp. into a single cylinder air-cooled engine calls for basic *High Torque* . . . the *load-holding Lugging Power* that keeps the equipment *working* through sudden shock loads. It also calls for heavy-duty construction in all details . . . plus dependable cooling under all weather conditions from sub-zero to 140° F.

Bulletin S-216, just off the press, will give you details about Model AGN. Write for it.

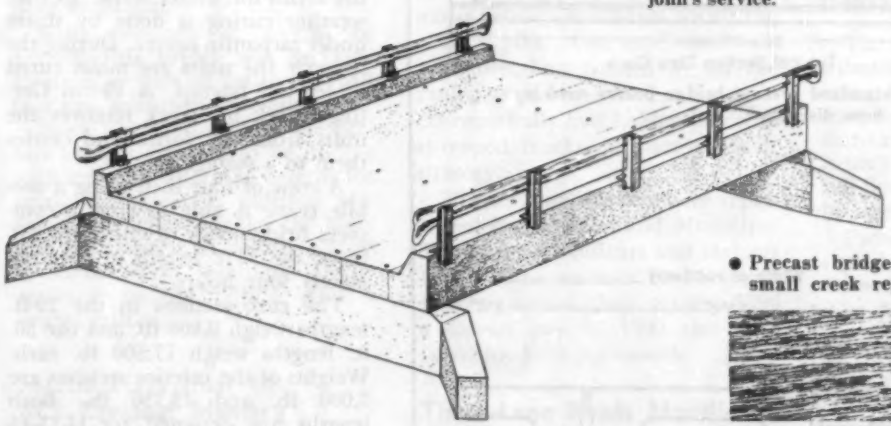
WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

A7-16134-½I

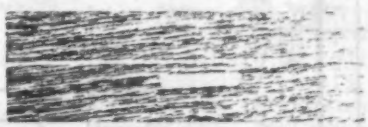
Prefab Bridge Units

Restore Creek Washouts

● Bridge failed today, traffic restored tomorrow? Not quite but coming closer, thanks to Katterjohn's service.



● Precast bridge deck for a typical small creek replacement structure.

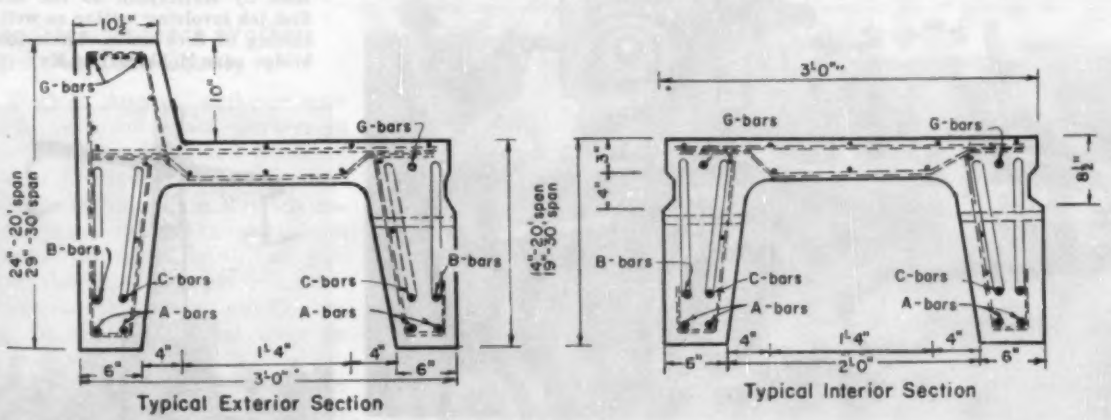


THE PROBLEM of quick restoration of traffic when a small highway bridge fails has been solved in the Kentucky state highway program. Reinforced concrete curb-and-deck sections are precast and stocked in a concrete products plant. This makes it possible to replace a failed bridge with minimum interruption of service depending on the condition of the original abutments.

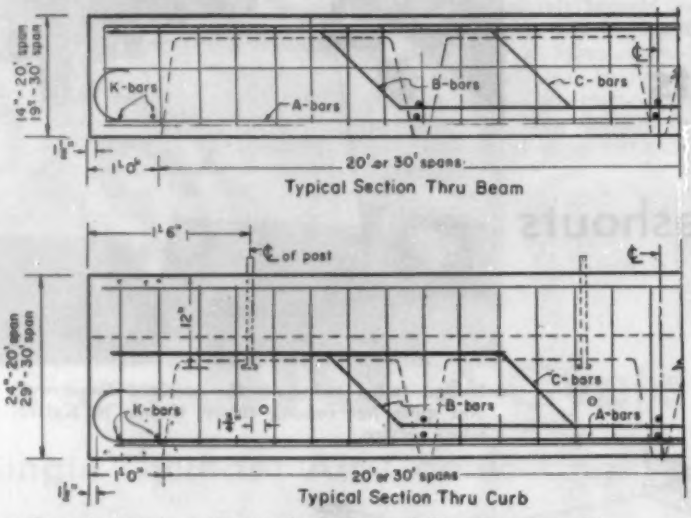
Recent replacements have been completed in three days, compared to a week or longer of traffic interruption had the poured-in-place method been used.

During the past two years 36 highway bridges in Kentucky were erected by this method. Three others were placed on rural roads in Indiana and another three on private projects in the Ohio River area.

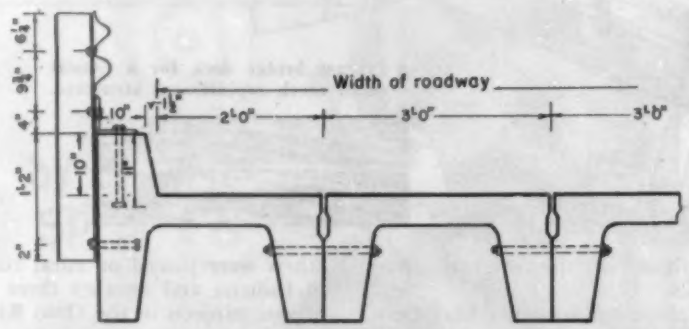
The plan in Kentucky has involved close cooperation between the state highway department and Katterjohn Concrete Products Co., of Owensboro. The structural units are being manufactured and



● Standard cross-section details for the Kentucky precast units.



● Elevation view of the standard precast bridge beams used in the Kentucky program here discussed.



● Detail of unit assembly for a typical secondary road bridge in Kentucky.

stocked in the firm's Owensboro plant under state highway specifications. The bridge members, 3 ft. wide, are cast in two lengths, 20 ft. and 30 ft. Curbs are 10 in. high. The 30-ft. members are 19 in. deep and the 20-ft. sections are 14 in.

When the highway department is notified of the failure of a small bridge, a truck and crew are quickly started toward the Katterjohn plant to pick the required units. The plant is equipped to cast one complete bridge of each length every week. A daily schedule calls for the casting of two sections of each length.

The forms are located on an outdoor casting bed. Steam lines heat the forms for winter work. In cold weather curing is done by steam under tarpaulin covers. During the summer the units are moist cured under wet burlap. A 10-ton Gerlinger fork lift truck removes the units from the forms and carries them to a storage area.

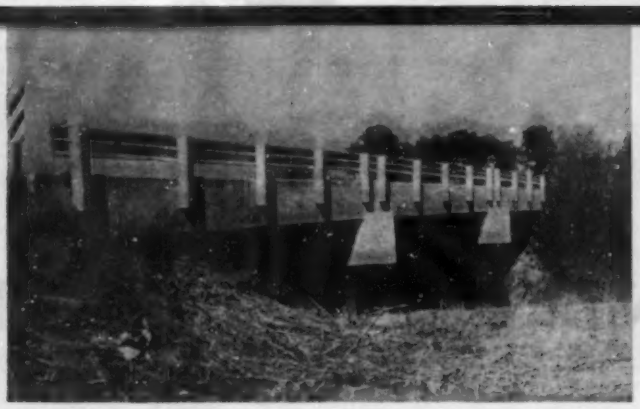
A crew of four men using a mobile crane is able to erect a complete bridge deck of either the 20-ft. or the 30-ft. length in approximately four hours.

The curb sections in the 20-ft. lengths weigh 9,500 lb. and the 30-ft. lengths weigh 17,500 lb. each. Weights of the interior sections are 7,000 lb. and 13,750 lb. Both lengths are designed for H-15-44 loading.

The crane with the lifting frame, seen in one of the photos, is setting deck units for a 3-span bridge, 72 ft. long by 21 ft. wide for the Little River bridge near Hopkinsville, Ky. This structure—the erection of the prefab units—was Kat-

● A lot less total cost as well as time is involved in replacement of small angle spans by this method.

● Three 72-ft. spans set in one day. Crane with special lifting frame used by Katterjohn on the firm's first job involving setting as well as casting of deck units. Little River bridge near Hopkinsville, Ky.



● **Typical 3-span creek bridge with Katterjohn units. Armco guard rail with steel posts bolted on side of curb panel. Stepped position of beams give superelevation on curve location.**

terjohn's first job. Local newspapers reported the job as having been done in a single day. Twenty-one units, weighing up to 9 tons, were set by a single crane, beginning at 10 a.m.

Built privately at a cost of $12,000 this bridge was on new location as part of an access road to a new suburban development.

From a cost standpoint the precast bridges are said to be in line with costs for alternate designs for small structures. In addition, precast construction enables the highway department to return a road to service with minimum inconvenience to the public after a bridge failure.

Seattle Plays Host to ACI Regional Meeting

On November 5 and 6, engineers and contractors interested in concrete technology will convene at the Benjamin Franklin Hotel in Seattle, for the 10th Regional Meeting of the American Concrete Institute.

The technical program covers many subjects, including topics of vital interest to highway and bridge people. Precast and prestressed construction will be extensively covered.

Road Maintenance Workers Strike in Cook County

During August, striking state highway maintenance workers in Cook County, Ill., asked Governor Stratton to intervene in their wage dispute with the state. Ray Schoessling, president of Teamsters Joint Council 25, asked the Governor to "put those men on a par with other municipal workers in Cook County, by granting substantial wage increases at once."

According to a local newsaper report, the 370 strikers, all Republican patronage employes were fired when they ignored a back-to-work order from the state Edwin A Rosenstone, a state director of public works, said he would hire 370 more patronage workers to fill the strikers' jobs. More applicants were available than needed to fill the ranks. As this was written, the strikers reportedly had hidden 88 county-owned trucks, as part of their strategy.

The striking workers were represented by the State and Municipal Teamsters, Chauffeurs and Helpers Union. The workers had rejected a plan to raise their present $290 a month pay to $300 and have asked for $340 per month.

Three-Lane Roads Modified In Pennsylvania Department

The Pennsylvania department of highways whose past regimes have favored three-lane road construction, now plans the progressive elimination of this type of roadway in the state system. More than 2,000 miles of three-lane highways eventually will be widened or otherwise modified to eliminate the three-lane feature.

Job Ideas

Contractor Operates Own Heavy Tire Service Truck

The service truck of the tire distributor, equipped with a heavy crane for picking up big off-road scraper tires, is a familiar sight on many road building jobs today. But it isn't every contractor who has a full-fledged outfit of this kind with his own nameplate on it.

Pictured here is such a rig, designed and equipped by George M. Brewster and Son, Bogota, N. J. The photos were snapped on this company's grading project on U. S. 17 in southern New York state. This dual-tired truck is equipped with a Chicago Pneumatic compressor and a hoist which operates hydraulically, powered by an electric motor supplied from the truck battery.

Also carried on the truck is an air tank and hose and tools for checking tire pressures and changing big tires in the field. The tires shown here are Goodrich, part of the large investment in tires required for this 3,000,000 cu. yd. project.

● **Changing Goodrich tires from Euclid rear-dump on job of George M. Brewster and Son, U.S. 17, southern New York state.**

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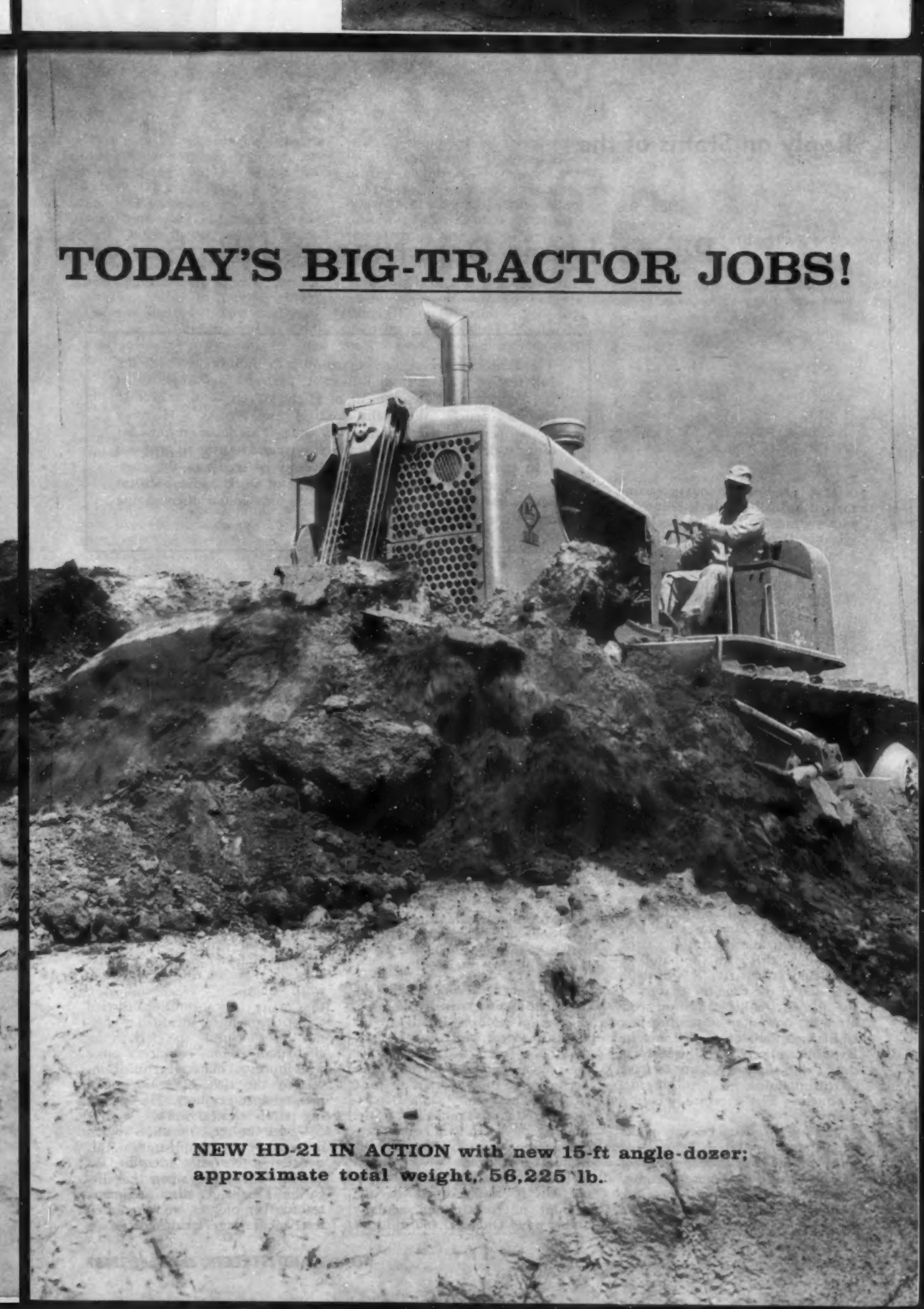

NEW HD-21 IN ACTION with new 15-ft angle-dozer; approximate total weight, 56,225 lb.

Reply on Status of the

Pennsylvania Department of Highways

The Editors welcome the opportunity to publish herewith the full text of a letter from Robert A. Farley, Chief Engineer of the Pennsylvania Department of Highways. It is in answer to the staff article "When the Political Axe Wrecks a Highway Department," carried in the July issue. This letter reviews recent developments within the department and its over-all progress.

In particular, this review gives deserved credit to the engineering staff of a state which has had to work under political conditions which many of its members have found discouraging and often personally distasteful.

To the Editor:

The July issue of your magazine carried an article which painted a rather dismal picture of the Pennsylvania Department of Highways. I believe that the record should be set straight.

Much has been said about the chaotic condition of the Highway department and how politics has brought havoc to our operations. I am certain that you will agree that in a department as large as that which serves Pennsylvania, there are bound to be certain inefficiencies. We are responsible for a 41,200 mile state highway system, and have paternal jurisdiction over an additional 60,000 miles. We have a working force of approximately 14,000 employees, distributed over the 67 counties of the Commonwealth.

If the allegations made by certain individuals and agencies were true, as indicated in your article, I am sure that the Department of Highways would have undergone a thorough investigation by the legislature of the Commonwealth. It is true that the administration of the Commonwealth is in the hands of the Democratic party. It is likewise true that at the time the charges of the alleged chaotic condition were brought, both houses of the state legislature were controlled by the Republican party. A bill was introduced into the Legislature to have an investigation made of this department. The measure was not passed.

The top operating officials of the department appeared before the joint Senate-House committee of the legislature on appropriations. Included on the committee was the Republican senate chairman of the highways committee and also the Republican chairman of the house highways committee.

The Department of Highways presented its budget amounting to roughly $606,000,000 for the 1957-59 biennium and was prepared to defend each item listed in its budget. In approximately two hours time the meeting with the appropriations committee was concluded. The Department of Highways made available to each committee member complete copies of all the details to support the department's budget. No action to investigate the department was initiated by the appropriations committee at this time, nor subsequently. The Secretary of Highways publicly welcomed an investigation of his administration of the highway department and offered to make available to any and all agencies the facilities of the department.

• I believe the record of the department as presented by the U. S. Bureau of Public Roads in its monthly report which lists the status of the federal-aid program for the several states speaks for itself. According to this report, as of June 30, 1957, the Pennsylvania Department of Highways ranks first in the amount of federal-aid work programmed; it ranks first in the amount of contracts advertised on which construction has not yet started; it ranks third in the amount of construction actually under way. Out of 1,450 miles of federal-aid Interstate allocated to Pennsylvania, we have definitely established the location, and have the Burau of Public Roads' approval of location of all but about 15 miles.

I believe the points in the article should be answered in the order in which they are listed.

1. *Trained highway engineers have been fired.*

Out of 14,000 men working forces of the highway department, about 1,432 positions are classified as purely engineering, or fall within the general classification of engineering, ranging from engineering aides up to and including the position of chief engineer.

When this administration took over the highway department, about 3,000 employees were carried on the roster as engineers; that is to say, their job title included the word "engineer." We found, also, that many clerical positions carried the titles which included "engineer"; for example, the clerk in the chief maintenance engineer's office who processed material requisitions carried the title of senior office maintenance engineer. He was doing purely clerical work.

Under the reclassification system initiated by our administration, this position is correctly identified as a clerk. Therefore, when the allegation is made, we dismissed many technical employees, we were, in effect, separating clerical forces.

We have 11 engineering districts in our department, each headed by a district engineer. He is the top man in the field. At the present time we have seven new district engineers and four old district engineers. I use the term "new" here to mean those men appointed after January 1955 and "old" as those men who were employees of the department prior to January 1955. Three of the old district engineers who were removed from their field positions were promoted to the central office and now hold important staff positions. The chief design engineer, a long time employee, was retained and retired in January 1957. The chief construction engineer was retained and he retired in May of 1956. Both these men were replaced by competent engineers.

• When the present administration took over the department, the positions of chief engineer and chief mantenance engineer were vacant due to resignations. These positions have been filled with qualified engineers. Until one month ago, our bridge department was supervised by old employees.

Going down the list of the major divisions of the highway department, I find the following units are being supervised by old employees, those with many years of service: Right-of-way, Legal, Township, Chief Draftsman, Construction Contracts, Cost Engineering, Federal-aid Engineering, Grade Crossing, Traffic, Highway Planning, Architectural, and Roadside Development.

When the record of separations from the department is analyzed by outside agencies, the record will show that 8 technical employees were separated from the department. These men, by virtue of education and technical professional attainment and registration, could be termed engineers. Men, who left voluntarily prior to assuming control of the department's administration have rejoined our forces. Several men who were dismissed have been recalled and are now at work.

2. *Department required to call in consulting engineering firms, inference that green engineering companies were given lush highway contracts.*

The use of consulting engineers by the highway department goes back many years before ths administration took over. Outstanding firms have been employed, and will be employed by this department to carry on its program. Consulting engineers are used when the volume of work is such that the department design staff cannot make the progress required to keep the program moving.

It should be emphasized at this point that before a consulting engineering firm is engaged on federal-aid highway work in Pennsylvania, the qualifications of the firm are examined by the U. S. Bureau of Public Roads and all engineering contracts must be approved by that agency.

We are using such outstanding firms as Michael Baker, Jr., Gannett Fleming Corddry and Carpenter, Modjeski and Masters, Ammann & Whitney; Albright and Friel, to name a few.

It is true that the department has been approached by many firms who are anxious to get into the highway field. We accept the credentials that they present, review their brochures and forward same to the Bureau of Public Roads' district office in Harrisburg. If, in the opinion of the department and the Bureau of Public Roads, a firm has sufficient background for highway design, then, and only then, is a firm considered for work.

3. *Department is accused of withholding millions of dollars owing the contractors due to its inability to close out completed jobs.*

This is a rather strong allegation and can be refuted by the facts in possession of the highway department. Approximately 65 percent of our final payment estimates are settled wihin 90 days after the completion and acceptance of the project. The balances usually are held up due to some litigation based on claims of the contractors or other factors.

4. *Charged with costly errors in design and location of highways and bridges due to inexperience of supervisors.*

This is an overall allegation, not backed up by facts. Certainly, in a construction or any design program of the magnitude undertaken by this department, there are bound to be errors. Errors can be corrected, and this we do.

5. *Report prepared by Associated Pennsylvania Constructors.*

Your article contains information regarding the report prepared by the Associated Pennsylvania Constructors relative to the highway department. For your information, the executive secretary of the Associated Pennsylvania Constructors prepared a report on the operations of the Highway Department over the past 15 years. A

Pittsburgh Editor Receives Highway Award

An editorial writer who has played a role in an outspoken campaign against Joseph J. Lawler's regime in Pennsylvania as secretary of highways, has received a top award. He is Arthur T. Moore of the Pittsburgh Sun-Telegraph. The $1500 cash prize is one of three given annually under the Ted V. Rogers Awards sponsored by Trailmobile, Inc.

The Sun-Telegraph continues its campaign for highway management policies it feels to be in the public interest. The August 29 issue quoted the Pennsylvania Motor Federation (AAA) as urging Governor Leader to appoint a qualified engineer as highway secretary.

The report announced that Secretary Lawler was scheduled to resign by October 1 to become one of the commissioners of the Pennsylvania Turnpike. Governor Leader was quoted as saying, Mr. Lawler was "taking the toll road post because its duties were less strenuous than running the far-flung highway system."

The report went on to note that Mr. Lawler had no experience in highway operations before taking the top job as highway secretary (which corresponds to Director or a one-man Commission). In this article the Motor Federation president, John S. Giles, (a Democrat) urged that a new secretary be appointed "whose background will be, if possible, that of an engineer familiar with highway problems."

copy of this report "leaked out" to the press prior to its submittal to the executive committee of the association which was holding its annual convention in Atlantic City in March of 1957. It is our understanding that the report did not meet with the approval of the executive committee of the association.

Secretary Lawler and his top staff, including all of his 11 district engineers met with the officers and the board of directors of the association shortly thereafter, and each district engineer in turn answered individually all of the points raised by the report. No further action was taken by the Associated Pennsylvania Constructors.

6. *Our relations with the contractors of Pennsylvania.*

I think the associations themselves can best answer that question. For years the associations have been after the highway department to pay interest on monies due and withheld after contracts have been completed. They have also wanted a reduction in the amount of monies retained while construction is in progress. Bills were introduced into the legislature of the Commonwealth at the last session, and were not opposed by the Department of Highways. These measures are now law.

• The contractors had been complaining that they were hungry for work. In the year 1956, January through December, the department advertised and put under construction $102,000,000 worth of work. Since January of 1957 to date, the department has advertised and/or placed under construction $148,000,000 worth of work. This does not include monies expended for maintenance projects to be done by contract.

Compare this with the greatest construction year in the department's history which was in 1950 when the department placed under construction approximately $150,000,000 worth of work. This year we expect to exceed that by at least $100,000,000.

If the department is in such a chaotic condition, how can we have accomplished what we have done and expect to accomplish?

Secretary Lawler is giving to the department in Pennsylania an honest administration. When an employe is found to be acting not in the best interests of the Commonwealth, he has been dismissed. Where evidence of fraud has been uncovered, the guilty have been prosecuted. Newspapers in Pennsylvania on August 6, 1957, carried a front page story to the effect that three supervisory employees of the department are to be prosecuted for fraud in the procurement of cinders. In a similar fraud case, the guilty are now serving jail terms. Two new district engineers and several county maintenance superintendents have been dismissed for cause.

• *As a general conclusion,* the accomplishments of the Pennsylvania Department of Highways should be investigated in the light of truth and not in the light of discontent. Political sponsorship for qualified engineering personnel has not been required since September of 1955. The executive board of the Commonwealth placed our highway engineering people under Civil Service. The governor of the Commonwealth requested of the legislature complete Civil Service for all employees. A measure to produce this result to give complete Civil Service protection was defeated in the legislature at the last session. Instead, a watered-down measure which gave protection for employees after 1959 was passed. This bill was naturally vetoed by the Governor.

Substantial wage increases have been given to all personnel in all fields in the highway department. In fact the raises in the engineering grades have caused the tide to turn. Men from consulting engineering firms are now joining us.

Our maintenance department, which encompasses 10,000 employees, was completely modernized in 1956 and at the present time will be greatly improved through further reorganization.

Very shortly the Department of Highways will announce to the engineering world a new method of earthwork computations and plan production which will revolutionize highway engineering and construction. Under this new method we are eliminating the necessity for plotting cross sections in order to compute earthwork.

This year the U. S. Bureau of Public Roads at the request of the International Cooperation Administration has sent eight highway engineers from foreign countries to study with the Pennsylvania Department of Highways.

In order to expedite plan production, a special unit has been organized and staffed to handle all coordination between the consultants and the department's central office. Trained engineers are in the field all of the time, making contacts with these consultants and solving the problems that arise where they should be solved—on the drawing boards in the consultants' offices. We do not intend to have a consultant proceed with work which is not set up correctly to our standards. Errors of commission and omission will be detected early in the game, such that when the final set of plans are received by the department.

• *Two top flight* veteran department engineers have been assigned to our key districts, one in Philadelphia, and one in Pittsburgh, to handle the tremendous Interstate program with all of its complexities in those areas.

Our construction division has been completely reorganized, and we have set up four construction areas in the state, each staffed with competent construction engineers to resolve any and all problems which arise due to contract construction. We believe that this unit will expedite decisions and eliminate any possible delays on the part of our construction contractors.

The largest continuous reinforced concrete pavement installation is now under way in Pennsylvania. While many states are barely getting their feet wet in the prestressed concrete field, Pennsylvania has installed and is installing over 300 bridges. Our proposals to the contractors include alternates for the inclusion of prestressed concrete bridges when so desired by the construction contractor.

Pennsylvania is undertaking the design of one of its major Interstate projects, using mechanical methods.

The field of soils control has been expanded ten-fold since January of 1955. We are requiring soils profiles on all projects.

We have completely revised our Right-of-Way setup and streamlined our operations in that office. In order to assist those people who are affected by highway construction, we have authorized the payment of 75 percent of the appraised value of the property, pending final settlement. This payment is made promptly.

We in the Pennsylvania Department of Highways, both new and old employees, are proud of our record, which speaks for itself.

Robert A. Farley, Chief Engineer,
Pennsylvania Department of
Highways, Harrisburg.

Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS—Annual Convention and Civil Engineering Show, Hotel Statler, New York, N. Y.; October 14-18.

NATIONAL SAFETY COUNCIL—Annual Safety Congress and Exposition, Conrad Hilton and other hotels, Chicago, Ill.; October 21-25.

NATIONAL HIGHWAY CONFERENCE FOR COUNTY ENGINEERS AND OFFICIALS, French Lick Hotel, French Lick, Ind. (sponsored by American Road Builders Association); October 28-30.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—Annual Meeting, Conrad Hilton Hotel, Chicago, Ill.; November 18-22.

THE ASPHALT INSTITUTE—Annual Meeting, New York Athletic Club, New York, N. Y.; December 4-5.

HIGHWAY RESEARCH BOARD—Annual Meeting, Sheraton-Park Hotel, Washington, D. C.; January 6-10, 1958.

AMERICAN ROAD BUILDERS' ASSOCIATION—Annual Convention, Sheraton-Park Hotel, Washington, D. C.; January 20-23, 1958.

ASSOCIATED EQUIPMENT DISTRIBUTORS—39th Annual Meeting, Conrad Hilton Hotel, Chicago, Ill.; January 26-30, 1958.

NATIONAL BITUMINOUS CONCRETE ASSOCIATION—Annual Meeting, Hotel Sands, Sahara and Flamingo, Las Vegas, Nevada; February 4-6, 1958.

Euclid Service Classes

During the current fall months, up to December 13, factory personnel are conducting classes in trouble shooting, maintenance, and repair methods for Euclid earth moving equipment at General Motors Training Center, Atlanta, Georgia.

These classes are being attended by representatives of Euclid equipment owners and distributors in the southeastern states. Each man gets a two-week general course, plus a week spent on specific models.

For enrollment applications and other details, write The Euclid service dept., Cleveland 17, Ohio.

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Caravan axles are your guarantee of "Rugged, Trouble Free Mobility" on rough construction terrain and for positive high speed trailing. Your men in the field are assured of dependable performance when their mobile equipment is mounted on quality-built axles by UNITED.

Caravan axles are available as single axle, two wheel assemblies and as four-wheel running gear. Equipped with automotive type steering mechanism, adjustable camber, caster and toe-in.

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Literature and individual counsel are available upon request.

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New Tesuque By-Pass ASPHALT

New Mexico's Chief Highway Engineer says ASPHALT

The new Tesuque By-Pass extending from the northern limits of Santa Fe to a reunion with the old Taos Road beyond Tesuque is a modern Asphalt highway. The lanes, shoulders, curbs . . . and even the six-foot median strip . . . are Asphalt-paved. And there are plenty of good reasons *why*.

"Least Initial Outlay"

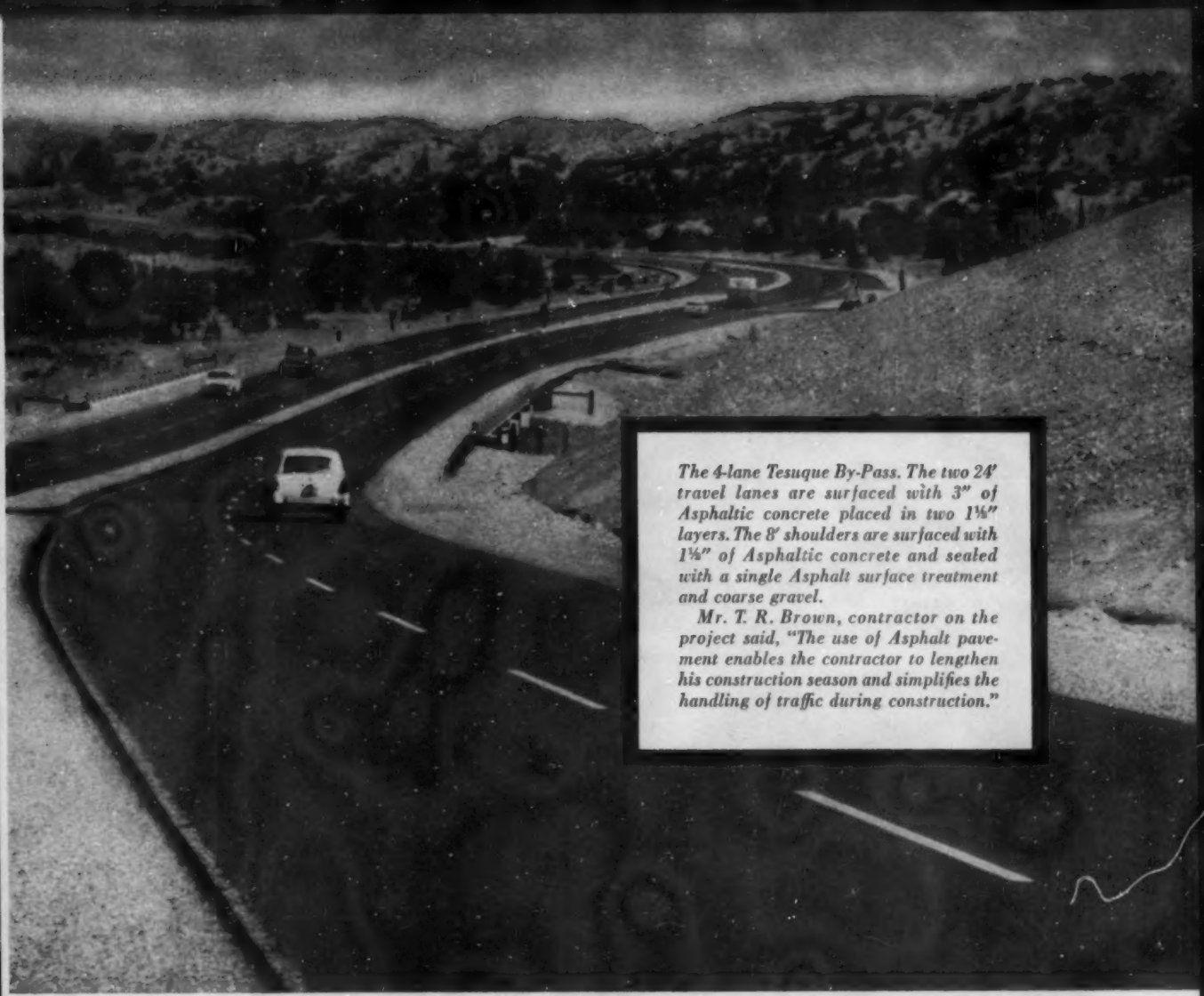
As Mr. L. D. Wilson, New Mexico's Chief Highway Engineer said after this project was completed: "The major portion of our highway construction will be heavy-duty Asphalt type . . . because it utilizes local materials and is most economical. By doing so, we can give the public the most miles for the least initial outlay."

One Free Mile in Every Ten*

With durable Asphalt construction you save up to 10% . . . and sometimes up to 50% . . . in paving costs alone.

This adds up to *one free mile in every ten* with modern Asphalt paving. Sometimes even more.*

Also, scientifically engineered Asphalt pavement costs no more to maintain. Often *less*. And maintenance is quick and easy, too.



The 4-lane Tesuque By-Pass. The two 24' travel lanes are surfaced with 3" of Asphaltic concrete placed in two 1½" layers. The 8' shoulders are surfaced with 1½" of Asphaltic concrete and sealed with a single Asphalt surface treatment and coarse gravel.

Mr. T. R. Brown, contractor on the project said, "The use of Asphalt pavement enables the contractor to lengthen his construction season and simplifies the handling of traffic during construction."

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You give taxpayers *more* economy with modern Asphalt pavement. You give them more, better and wider highways. Smoother-riding, rugged pavement with plenty of built-in skid resistance.

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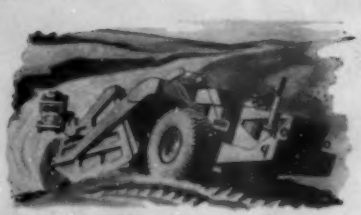

DIRT-MOVING JOBS

FLEX-RITE construction prevents unnecessary tire failures!

THE new B.F.Goodrich Rock Service tire—unlike an ordinary tire—is *built to its inflated shape*. When inflated, the tire body is not distorted. The whole tire flexes evenly, uniformly. No *localized* stresses that often cause unnecessary tire failures. FLEX-RITE construction eliminates this major cause of tire trouble and expense!

New B.F.Goodrich Rock Service tires are built with FLEX-RITE nylon cords. There are no cross threads to rub and chafe, creating tire-killing heat. FLEX-RITE nylon cords withstand double the impact of other materials, resist heat blowouts and flex breaks. Result: more retreadable Rock Service tires.

Greater traction! Puncture protection!

The double chevron tread gives maximum traction and skid resistance in forward or reverse. Rugged sidewalls defy rock bruises. V-shaped grooves expel stones. B.F.Goodrich Tubeless construction runs cooler, protects against punctures, cuts maintenance costs, is easier to service.

See the new, money-saving Rock Service nylon tire at your B.F.Goodrich dealer's today. It's the most advanced tire on the market today built for off-the-road hauling. *B.F.Goodrich Tire Co., A Division of The B.F.Goodrich Co., Akron 18, Ohio.*

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A Rainy Summer Along the Illinois Toll Road, But –

Ralph Myers Sets Earthmoving Record

Scraper-loader-dragline outfit moved 1,450,000 cubic yards in a 44-shift working month. Rainy weather was "outfoxed" by methods known to many contractors but which depend on managerial vigilance (and good operators) for effective application.

By Harold J. McKeever
Editor-in-Chief, Roads and Streets

CONTRACTORS strung along $250 million worth of toll road projects in Illinois last summer had good reason to complain about the exceptionally wet weather. Many outfits were grounded for days on end.

But not Ralph Myers Contracting Corporation! This veteran dirt-movin' outfit hardly missed a day on contract sections T-12 A, B and C.

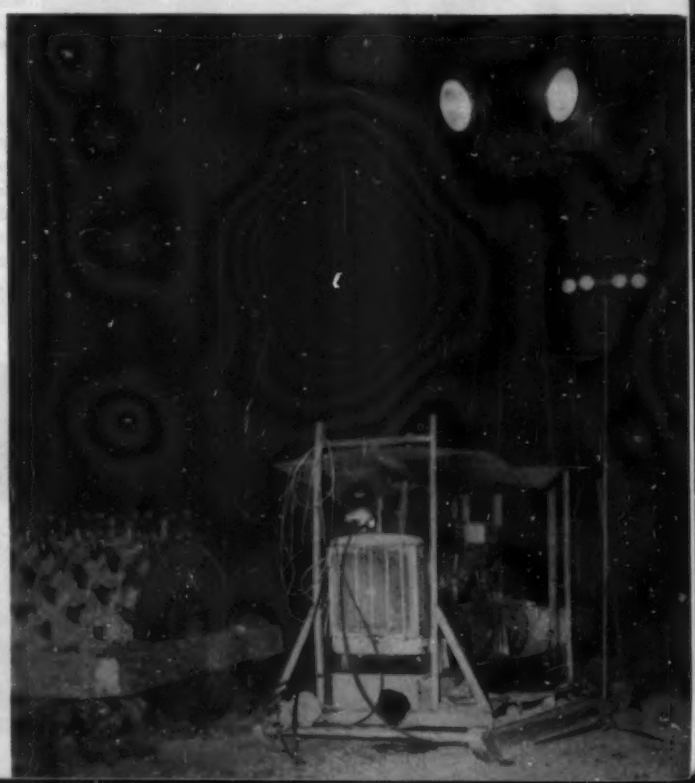
The details make quite a story. The Myers organization is subcontractor responsible for 5,250,000 cu. yd. of grading on T-12 under the prime contractors, Gust K. Newberg Construction Co., and Hoyle-Newberg Construction Co., of Chicago.

Project T-12 is located about 35 miles northwest of Chicago near Libertyville, Ill., is nearly flat terrain. The 12.2 miles of dual highway including five interchanges requires a large earth yardage principally because of the raised grade required for interchanges and overpasses. There is one continuous 5,300 ft. section of 30 ft. high fill where the grade doesn't come down between rail overcrossings. The bulk of the job hence is borrow. Much yardage has come from roadside pits designed to form recreational lakes.

Myers farmed out 1,500,000 cu. yd. to William Wyant, of Park Grove, Ill., and 500,000 cu. yd. to Lakeside Construction Co., of Chicago, Ill. The 3¼ million yards which the firm kept for itself is divided between shallow prairie cuts and fills, with short haul, borrow with hauls of 1,000 to 2,500 ft. and some yardage with longer hauls over the grade.

The equipment fleet was assembled with these needs in mind, drawing from Myers projects nearing completion in Pennsylvania, Tennessee and Ohio, plus factory-new units.

The Myers organization arrived on the job June 3, 1957, and started clearing brush. On June 4 the firm went to two 9-hour shifts, and it kept to double shift, six days a week, to the end of August. During the interval from June 3 to 19, when the monthly estimate was taken, the firm got a good start. In the June 19 to July 19 period it moved over a million cubic yards.



● One of several Cat. 30 kw diesel generator sets used for the high-speed scraper work.

● **The Myers fleet of "mixed" scrapers (Euclid, Cat. and LeT Westinghouse) working near sundown. Second Shift has just begun. Pushloading in foreground being done uphill to undercut an area of unsuitable material for spoiling.**

● **Thirty-five foot tower, carrying 1,500-watt floodlamps. Skid-mounted generator towed along as needed by a tractor.**

And between July 19 and August 19 the output reached 1,490,000 cu. yd. This is a record for this 30-year-old company, representing an average of over 65,000 cu. yd. per double-shift day (22 days worked). Scraper work alone, using 12 units, reached a maximum of 28,000 cu. yd. in 9 hours (before the Euc loader arrived).

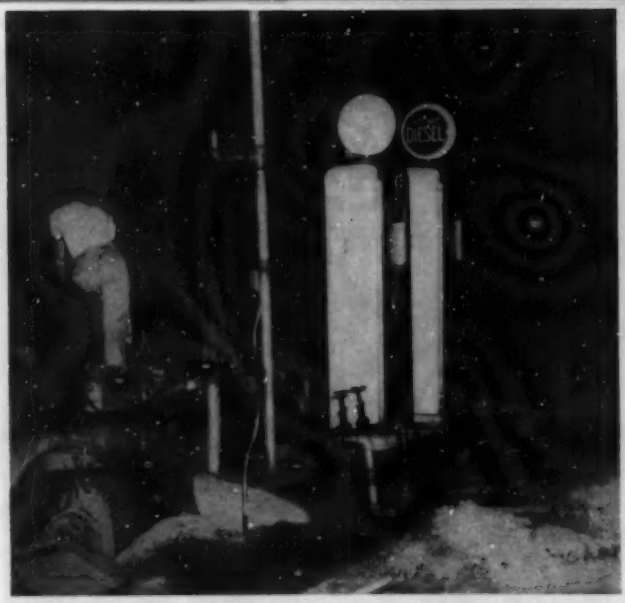
As usual with earthmoving contractors, the Myers supervisors were not too good with words in telling how this yardage was accomplished —and done at a time when many toll road contractors were repeatedly stopped by rain and wet conditions.

Eye-witnesses, however, offer several explanations.

First is the management personnel. The job is being bossed by Pete Jackson, veteran earthmover and vice president of the firm. His two sons, Ernest and Glenn, and the day and night foremen, Clarence Kidd and Clinton Naugle (20-year men in firm), round out a team of supervisors who spent long hours on the job, analyzing progress and figuring where the machines should be working tomorrow and next week. "The bosses on this job get up early, too," was one operator's comment.

Secondly, the company had plenty of good equipment, well chosen

● **Pedestal-mounted 150 watt lamps used along the grade, or alongside the tower lights for servicing and repairs. (Below): A D Tournapull in floodlit area, getting a minor check-up, around 11 pm.**



● Sinclair fuels being unloaded into underground dispensing tank, located at Myers' shop area.

● One of the towers carried as high as thirteen 1,500-watt lamps, in order to illuminate farther and make for fewer moves.

for the conditions. The firm's equipment was a "mixed" fleet, but an effective one with ample capacity.

Scrapers included 3 Euclid S-18 single-engine units, 3 Euclid TS-24 twin-engine, 5 Caterpillar DW21s with model 470 pans, and 2 B Tourapulls.

Scrapers were push-loaded by 4 Cat D9s plus D8s as needed from the 10 on hand. Other equipment included a Gradall, 4 Cat 12 graders, 2 Gebhart 3-drum and two 2-drum sheepsfoot units (D8 drawn), 2 Ferguson tandem discs, water wagons (which were seldom needed), service rigs, and light plants.

Two draglines—a Northwest 80D and a Bucyrus-Erie 22-B—were used for ditching, excavating for culverts, removing swampy material and dressing fill slopes. A separate spread which swing into action consisted of a new Euclid loader, equipped with an extra 4 ft. of belt, Model 9BV182, and 11 Euclid bottom-dumps (the latter all over 11 years old!). This outfit worked the big borrow pits in conjunction with long hauls.

Third was the decision to go to two shifts and stay there. The machines ran from 5 a.m. through to midnight. Some of the best runs were at night, since finish grading was always left to the day shift. The engineers and inspectors cooperated by keeping the soil samples coming.

A fourth factor in the good production was the skillful breaking in of operators. The company has some good men of its own, but most of the men were new. The men were put with experienced operators and soon picked up the tricks from continual, informal teaching on the job. The operator problem was not always completely solved, however. The double-shift all along the toll road, plus boom conditions in the Chicago area, made good men scarce. On many days some part of the fleet was idle for lack of operators. The chief concern was to use the available men on machines selected to make up efficient work teams.

Push loading with D9s was credited with being an important factor in the fast production. The pushers didn't hesitate to get behind the twin-engine as well as the single-engine scrapers when the clay was stiff, or the load path had to be upgrade. At other times the twin-engine scrapers were assigned to areas carefully selected to make good cycle time on medium hauls without pusher assistance.

A fifth contributing factor in keeping up high production—and one of the most important—was the skill with which the Myers organization out-foxed the weather. The operators had orders to keep all work cleaned up as they went, insofar as was practicable. Fill area were kept well crowned as filling progressed—lifts crowned to 3 ft. on wide fills. The field office through its RCA and Motorola radio equipment and by phone kept checking on the weather outlook, as a guide to their planning.

And when threatening clouds rolled over, the operators swung into a special routine. Depending on how bad the sky looked, all or some of the operators, for example, were sometimes seen to get onto a fill with rubber-tired equipment, and hastily "roll" it down tight in carefully overlapped passes, getting as much of this preparation done as possible before a shower hit. A fill thus packed down, it was repeatedly proved, would shed water and resist infiltration so well that, on the next day, or even the same day, the inspectors could OK it for moisture and allow filling to proceed. "This rolling often was begun on an instant's notice and

● Heavy Amco discs in tandem, drawn by a high-speed tractor, were kept busy much of the time due to the heaviness of the clay and the unseasonable rains.

didn't take five minutes—but it made a real difference," to quote one of the superintendents.

Topsoil was skimmed off of wide areas ahead of the work, even in places where the contractor knew the scrapers wouldn't be working for another month. The topsoil of the area was a dense material, which acted as a blanket against drying out. Once uncovered, the underlying soil even though it was clay dried out much faster—a detail learned from the Myers' long experience.

Ditching was another trick revealing long experience. A lot of ditches were dug before doing anything else, and this too paid off in practically eliminating "no work" days during wet spells.

Tightly packed fills and haul roads also helped resume hauling hours or days sooner than would have been the case, had precaution not been taken. This was demonstrated by the fact that Myers equipment was often seen working on days when many other contractors were partly or entirely down. So well did the technique of weather-watching and fill rolling work that Myers lost only one entire shift during the wet months of June and July.

Light plants for the night shift consisted of 2 Caterpillar 30 kw diesel generators on skids, and several 5 and 10 kw units of various make. The larger plants were tower units carrying from 5 to as many as 16 1,500-watt floodlamps. The large plants also supplied batteries of 150-watt lamps strung along the edge of the grade or spotted for servicing or mechanical check-up. Lights carried on most of the equipment, front and back, did the rest.

The material in this project has been clay and more clay, ranging from good workable brown clay to stiff blue clay. Because of the exceptionally rainy summer, discing was a continuous operation at times; at other periods it was done in the early morning hours to help the sun and heat hasten drying. Drawn by Euclid tractors, discs intermingled with the sheepsfoot rollers. This was for the purpose of breaking up chunks and clods for more effective rolling, as well as for aeration.

Rolling was routinely handled, with results which easily met 95% modified AASHO density requirements. The 5-ft. drums were weighted heavier than those found on some toll road jobs; for more economical results in the heavy soil.

Charles W. Cole & Son are the contracting engineers on Section T-12, under Joseph K. Knoerle & Associates, Inc., consultants for the Illinois Toll Road Commission.

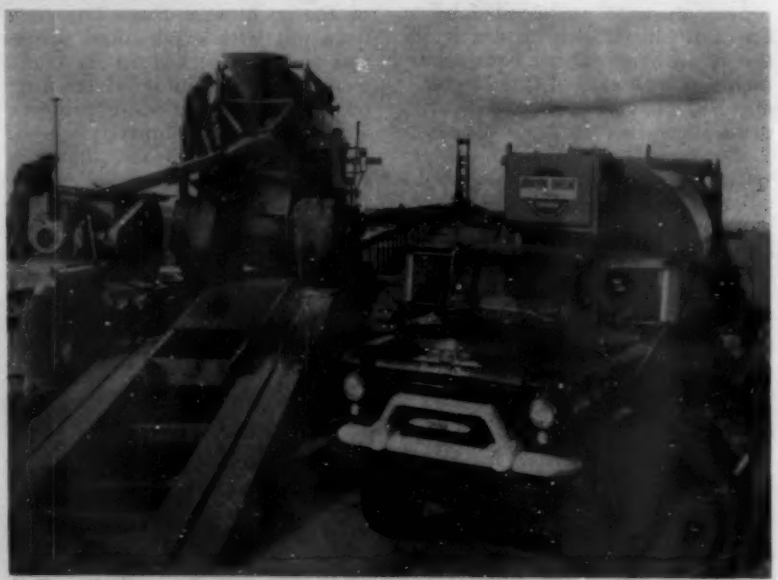
Transit Mixed Concrete Pumped into Place at Mackinac

The smoothest teamwork has been necessary to keep concrete flowing to construction workers on the Mackinac bridge linking Michigan's upper and lower peninsulas. To get the concrete out to the workers on the 8,614-ft. bridge, it is poured into an 8-ton pumping machine on the deck. The pump forces the concrete through an 8-in. pipeline to paving crews working as far as 800 ft. ahead of the pump platform.

The factor of a continuous flow of concrete to the pumping machine loomed important because a break in supply would cause the concrete to harden inside the pipeline, crippling the paving project.

Keeping the pump's hopper filled with concrete required a fleet of GMC transit-mix trucks. They took on sand, gravel, cement and water at a batch plant ½ mi. from the bridge, doing the mixing en route, and carrying the supply up to the pump, anywhere from 40 to 80 ft. above the Straits of Mackinac. During paving operations, the trucks loaded, mixed and unloaded concrete in 20-min. cycles.

● As part of an expansion to handle the growing volume of highway work, the Kansas highway commission has given full department status to the division of research and materials. R. L. Peyton, research engineer, has been appointed chief of the department.



● Two GMC transit-mix trucks shown delivering load to pumping machine, which forces concrete along span to paving crew.

Ready to Build?... *With What?*

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PRESTRESSED CONCRETE

Today, structures of virtually every description are being built of prestressed concrete (not to be confused with reinforced concrete). Garages, schools, office buildings, factories, warehouses, hospitals and motels, highway bridges and piers are typical examples of this increasingly popular building material.

Most prestressed concrete structures employ precast pretensioned members in which high-strength steel strands are stretched in forms before the concrete is poured around them. After sufficient curing to bond the concrete to the strands, the tension is gradually released.

Construction speed, structural balance, permanence, insurance benefits and economies in maintenance and design are just a few of the advantages that are realized in prestressed structures—factors to be considered in any proposed building.

Roebling, as a pioneer in the development of prestressing elements and techniques in the United States, is in a position to furnish you with complete information and assistance on any matter concerning prestressing methods, applications and materials. Write Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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An Example of Surcharge Application to Speed Fill Settlement

Problem: a deep silt substratum beneath a 280 x 1300 foot fill area for a tunnel toll plaza. Solution: a 20 foot surcharge, selected after detailed theoretical analysis, which produced consolidation within the 6 months time available.

By William F. Hallstead

Whitman, Requardt and Associates, Consulting Engineers, Baltimore, Maryland

THE IMPORTANCE of taking sufficiently deep test borings when designing fill over doubtful ground is borne out by experience on section D-3 of Baltimore's Harbor Tunnel. This project also affords a good illustration of how closely today's soils engineer can sometimes predict accelerated settlement by means of a surcharge fill.

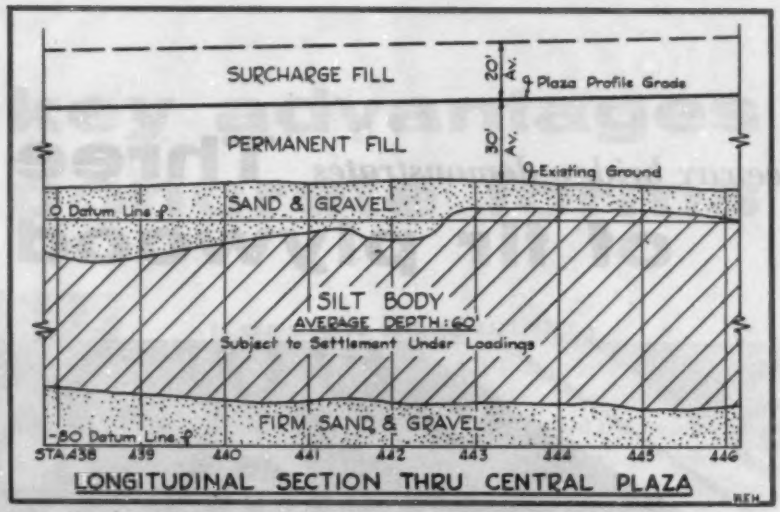
When the consultants handling the final design for section D-3 of Baltimore's Harbor Tunnel studied their final test boring data a serious problem was confirmed. The site for the 14-lane toll plaza had at first appeared an excellent one, it was to be located over an existing gravel bed near the future tunnel's southwestern mouth. The Arundel Corporation, suppliers of construction material, had been excavating sand and gravel from the area for some time and preliminary borings had indicated at least 20 ft. more of high bearing capacity material largely in AASHO soil classification groups A-1 and A-2-7.

The plaza fill was to be 1,300 ft. in length and 280 ft. wide across the toll booth area. The wide pavement expanse was to top a 30-ft. high fill. With 2-to-1 side slopes, this plaza fill was to constitute an impressive tonnage of earth. And now the final design borings revealed that below the Arundel pit, in fact, beneath the whole area, lay an extensive stratum of silt classified in the A-4 group. This silt body was more than 60 ft. in depth in some of the test holes, and it was subject to settlement under load.

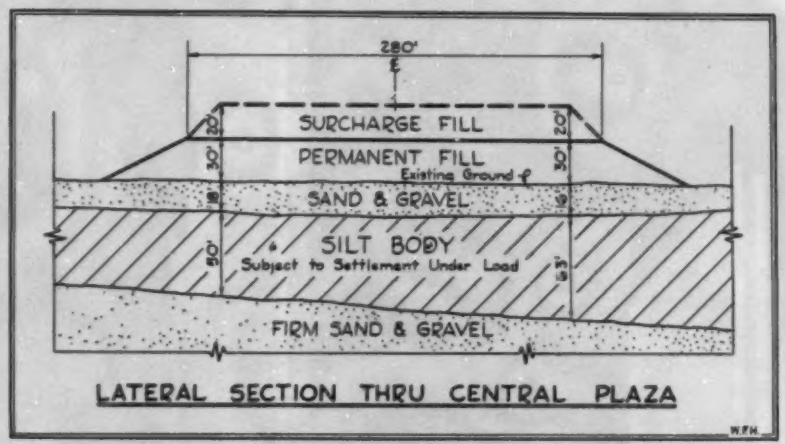
The plaza location was set. Now the problem had resolved into one of stabilization of the silt body to forestall future subsidence. At the midplane of the silt layer the initial load of the existing ground was 1.81 tons per square foot. With the proposed 30-ft. high plaza in place this loading would increase 1.87 tons/s.f to total 3.68 tons/s.f. for the final load.

As in standard practice, the engineer averaged his random soil samples to obtain settlement limits and times. Examination of eleven consolidation tests showed that in the range of loading to be applied, six samples had coefficient of consolidation values between 0.01 and 0.05 and 5 had coefficient of consolidation values below 0.01. Based on the Terzaghi Theory, a time rate of settlement determination indicated that ultimate settlement with the 30-ft. plaza fill, in place, would range up to approximately 1.84 ft.

● Site of the surcharge fill shown at (2), toll plaza area approaching Baltimore harbor tunnel (1).



● Showing the hidden silt body which was revealed by final design borings.



● The permanent and surcharge fill in relation at a typical lateral section.

and that satisfactory consolidation with the 3.68 tons/s.f. loading would require 1.12 years.

One of the engineer's worries lay in the shearing properties of the underlying soil. Would the massive plaza compress the silt body straight downwards, or would the unreliable soil give way and simply be forced outwards and upwards? Subsequent conservative computations of shearing strength determined the safety factor to be 1.75 as compared to a required safety factor of 1.50.

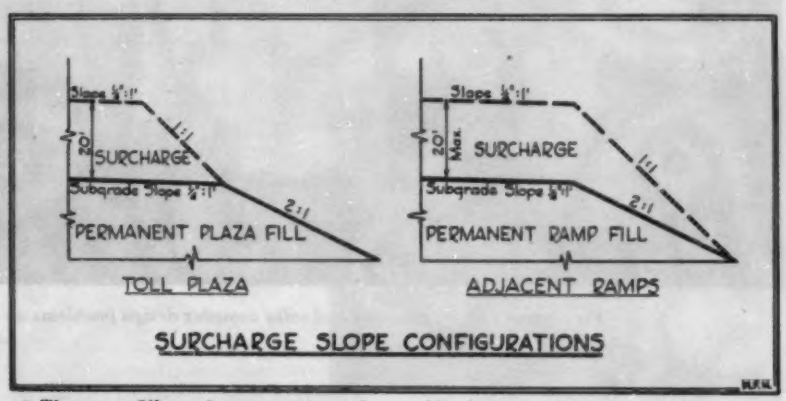
The proposed 30-ft. fill would satisfactorily consolidate the silt stratum in just over 13 months, but the construction schedule permitted about 6. The decision was to accelerate consolidation by means of an earth surcharge. The proposed plaza fill would be placed and compacted, then an additional mass of earth would be piled on top of it forcing a comparatively rapid settlement of the underlying silt.

The soils engineer determined the times required for satisfactory consolidation under various overloads. A 10-foot depth of surcharge would produce 100% of the theoretical settlement within a 9½ month period; a 15-ft. deep surcharge would require at least 7 months and a 20-ft. surcharge could do the job in just over 5 months. Or, 25 ft. of additional fill would consolidate the silt well under the available time limit, but a 25-ft. depth was judged to be an impractical construction. The surcharge was to be utilized in construction after it was stripped off the settlement area, and a 25-ft. depth of surcharge would involve well over the 270,000 cu. yd. of fill that could be disposed of in the final construction. A 20-ft. overload depth permitted a far closer earthwork balance.

Setting the surcharge depth at 20 ft., the engineer undertook a study of configuration for the surcharge slopes. The final configuration slopes are shown in the accompanying sketch. On the toll plaza fill proper the side slopes of the additional fill were set at 1:1 with the toe of slope coincident with the shoulder of the permanent plaza fill. This scheme was not used on the adjacent ramp surcharge. To impose an appreciable load on the narrow ramp fills the engineer carried the 20-foot depth all the way to the shoulder of the permanent ramp fill and directed a 1:1 slope grading of the spillover.

On April 27th, 1956, the first 3-ft. lift of the toll plaza surcharge was placed by 3 shovels, 2 dozers, a roller and 27 ten-yard dump trucks of the C. J. Langenfelder Company, the prime contractor. By May 28th the total overload was in place. Throughout the toll plaza surcharge, ten 3-ft. x 3-ft. settlement plates were embedded in the fill. As construction had progressed upwards, 4-ft. lengths of 2-in. steel access pipe were added finally to

(Continued on page 120)



● The ramp fill surcharge was topped out wider because of its narrower width.

Pasadena freeway bridge demonstrates **Three of fir plywood**

Fir plywood forms cut costs and solve complex design problems on this Pasadena freeway bridge

key advantages concrete forms

1. design adaptability

On this 3.3 million dollar Colorado Street freeway bridge, Pasadena, California, fir plywood helped solve a complex form problem posed by the six giant arch ribs supporting the roadway. Forms were 5/8" fir plywood, specified because of its adaptability to built-up slip forms.

2. time and labor savings

Fir plywood also speeded construction time for huge built-up form sections used for scores of spandrel columns and main pier columns. Sections ranged from 5 to 80 feet in height. Workability and multiple re-use make fir plywood ideal for such applications.

3. smooth concrete surfaces

Fir plywood was specified by the California State Highway Department to assure smooth surfaces on all exposed concrete. The contractor, Guy F. Atkinson Co., developed the form system which was moved laterally from one arch to the other, an engineering feat considered to be unique in the construction field.

Close-up of 5/8" fir plywood arch rib form section. After pouring one set of arches, entire falsework was lowered several inches and skidded into place for second set.

Workmen stripping one of giant built-up 80-foot column forms. Forms were of 5/8" fir plywood with 2 x 6 studs and walers. Multiple re-use is one of plywood's many advantages in the form field.

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● Stripping away of surcharge fill from extreme western end of toll plaza area.

SURCHARGE APPLICATION

(Continued from page 177)

protrude above the completed fill. Through the consolidation period settlement of these plates was recorded twice each week by precise level readings.

The engineer plotted these level readings for each settlement plate as shown on the sketch. Readings during the first months of the actual settlement period showed that a consistent and steady consolidation was under way. Near the end of the predicted 6-month limit the plotted settlement curves leveled off and the area was shown to be satisfactorily consolidated.

Through a 4-month period in late 1956 and early 1957, 4 tractor-drawn scrapers and 2 dozers stripped off the surcharge and placed it in fills through the 1.4-mile length of design section D-3. The permanent toll plaza fill was fine graded and by July 1st, this year, paving of the 14 traffic lanes had begun.

Final design for the Baltimore Harbor Tunnel toll plaza was handled by Whitman, Requardt & Associates; Henry W. Janes is the firm's soils engineer. General consultant was the J. E. Greiner Company and C. J. Langenfelder is prime contractor for the project now under construction for the Maryland State Roads Commission.

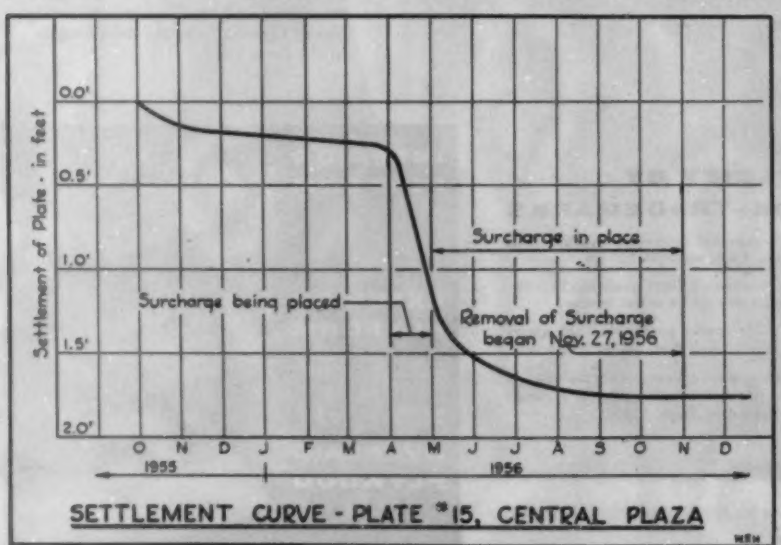
With Fixed Speed Limits, Illinois Fatalities Drop 26%

Advocates of a tighter limit on top highway traffic speeds as a means of holding down accidents have a case in their favor in the recent statistics in Illinois.

Traffic fatalities on the highways of this state declined 26 percent in July, the first month in which the new fixed speed law limit was in effect, according to a news report. Still, however, 130 fatalities occurred of which 16 were in Chicago.

A speed limit was adopted by the Illinois legislature as part of the traffic safety program backed by Governor Stratton. Highway police force is to be increased from 600 up to 1100 men; the state is to aid in financing a driver education program; and automatic driver license examinations are provided for drivers over 70 years of age.

The problem of educating the public to comply with the new speed limits is recognized as a difficult one.



● The results in one quick glance: settlement accomplished in accordance with soil mechanics theory.

All Bids Above Estimates Virginia Adopts New Policy

After considerable discussion on the question of handling bids submitted on a project, all of which are above the tolerance of 10 percent over the estimate, the Virginia highway department has decided to change its policy governing these. On any project on which the lowest bid submitted is above the established tolerance, the department will not read any bids but will simply make the statement that the bids will be checked and if checking of the figures indicates that one of them falls within the tolerance, all will be treated as acceptable bids. Otherwise, no tabulations will be issued by the Department and the bids will be rejected. This policy will be adopted on a trial basis and, if satisfactory, will probably be continued. This practice "will not expose the unit prices of the lowest bidder and seems entirely fair," according to the Virginia Road Builders Association.

Special Mortgage Plan on Road Displacements

A special type of mortgage insurance to assist in the relocation of families displaced by construction of roads, highways and urban expressway projects under the federal highway program is available under the National Housing Act.

gage insurance, known as Section 221, authorizes financing terms more liberal than are available under other provisions of the act in order to stimulate construction of dwellings needed to rehouse families displaced by all types of government action.

PRESTRESSED CONCRETE

(Continued from page 70)

unscrupulous promotions." Mr. Erickson said that at the time the Walnut Lane bridge was built in Philadelphia, first of its kind in America, there were no codes or specifications for prestressed concrete. So in 1952 the bureau prepared criteria and circulated copies among leading engineers, asking for comments and suggestions. The response was gratifying, he said, and as a result the criteria were revised and published in the present form in 1955. He said it is now the only guide to prestressed design that provides structures acceptable for federal aid projects. Mr. Erickson referred to a bridge which he said the bureau hopes to build in Mt. Rainier Park in cooperation with the National Park Service as a test of prestressed concrete.

Mr. Erickson was followed by David M. Goodall, senior bridge engineer, Bureau of Public Roads, Region 8, Portland, Ore., who gave a detailed description of the proposed long-span, high-level Nisqually Glacier bridge. If the prestressed concrete alternate is approved, Mr. Goodall said the bridge would have the third longest prestressed concrete span in the world, a center span of 300 ft. He said the length of this span is exceeded only by a 320 ft. center span of a prestressed concrete bridge under construction in Australia and a 350 ft. span of a continuous bridge in Germany. The Nisqually bridge is designed to carry traffic on the Steven's Canyon highway in Washington.

Nisqually Glacier Bridge

Three bridges built near the same location, Mr. Goodall said, have been destroyed by combinations of rock, earth and water surges since the turn of the century. The last of these was a 100-ft. span reinforced concrete arch bridge built in 1933 and destroyed in October, 1955.

Mr. Goodall declared that engineer's estimates indicated a substantial saving could be effected by the use of the prestressed concrete design. He said, however, that the project had been advertised for bids on the basis of structural steel deck girders and an alternate using prestressed concrete spans.

Building of the 24-mile Lake Ponchartrain prestressed bridge in southern Louisiana was described as, in some respects, more of a manufacturing job than a construction project. W. F. Palmer, Mobile, Ala., consulting engineer on this "longest bridge in the world" project, explained that the structure's 4,558 prestressed concrete piles, as well as the pile caps and deck slabs, were cast ashore in a $6 million plant set up for that special purpose. These elements were assembled in place, enabling the completion of a record-breaking 3,000 lin. ft. of construction per week. The prestressed piles, he said, were driven to 80 ft. below the water line.

A number of unusual construction and design problems were involved in the project, Mr. Palmer said. These included determining the contour of the bridge with relation to the curvature of the earth, fixing its location by triangulation and allowing for a total of 132 ft. of expansion due to temperature variations between winter and summer.

Toll Road Program

How prestressed concrete replaced 45,000 tons of steel in bridges on the 193-mile Illinois Toll Highway was told in detail by M. E. Bender, chief bridge engineer of Joseph K. Knoerle & Associates, Inc., Baltimore, Md. He said the use of prestressed concrete on 224 bridges on the Illinois Toll Highway was "the first case of mass production of such material being employed for work of similar extent and nature." This represented a saving of approximately $4,000,000 over the estimates. This departure from conventional methods in the design of bridges, Mr. Bender said, was one result of a search for ways to reduce bridge costs and improve construction schedules.

By the time the revenue bonds for the Toll Highway were sold, Mr. Bender related, it was becoming evident that all possible means of reducing construction costs and shortening time schedules should be examined.

"The investigation of alternate bridge types was carried out with emphasis on economy, including first cost and maintenance, availability of material and construction time," Mr. Bender said. "Prestressed concrete, as a relatively new design medium, seemed to offer most in meeting requirements. . . ."

Designs were prepared for typical underpass and overpass structures using prestressed concrete members in place of steel stringers. These designs were turned over to three firms currently conducting precasting operations, for examination and cost estimates. "The estimates," Mr. Bender said, "indicated that if full attention were given toward uniformity and volume of manufactured products, the replacement of steel stringers alone would result in considerable savings."

Comparison of probable maintenance costs also pointed favorably toward the use of concrete, Mr. Bender said. On the facts shown by economic studies and in the light of evidence that steel prices would continue to rise and deliveries remain slow, it was decided to develop a bridge design incorporating all possible economies. "It was desired," he said, "that, in such a design, prefabrication of members should be carried out as far as possible so that advantages such as lower costs, reduced construction time and improved quality of product could be realized." On this basis plans were prepared for a typical bridge incorporating the following component parts:

1. Conventional stub abutments.
2. Piers using prestressed cylindrical concrete piles with precast pier caps.
3. Prestressed precast concrete stringers.
4. Precast concrete diaphragms.
5. Prestressed precast concrete plank to act as deck forms and to become part of the deck.
6. Cast-in-place concrete deck.

The Illinois State Toll Highway Commission and George L. Jackson, chief engineer, then approved a proposal to build a full-scale test bridge according to these plans. A site was selected on Beverly road in Cook county and a construction contract was awarded to the W. E. O'Neill Construction Co. The required prestressed members were made by Prestressed Structures, Inc., at their plant in Franklin, Ill. Construction on the test bridge started May 21 and was completed on July 8, 1956.

Test Procedure

Jack R. Janney, Chicago consulting engineer, set up the testing procedure and supervised and conducted the testing program for the Illinois Toll Highway Commission. Tests were carried out at various stages of construction and also on the completed structure. Tests of certain structural members were also conducted at the casting plant.

At the same time special investigations relating to the project were being made at the Fritz Engineering Laboratory, Lehigh University, Bethlehem, Pa. Observation of the test bridge during construction and study of the test data brought about final acceptance of some points for inclusion in the bridge design. "The evidence was favorable to the use of prestressed concrete members," Mr. Bender said, "and preparations were made to include them in the final design within certain span limits." Changes in the design included rejection of the prestressed plank to serve as deck forms in all but nine bridges; elimination of intermediate diaphragms from the final design; reduction in thickness of cotton bearing pads and elimination of provisions for precasting pier caps.

He added that the "Criteria for Prestressed Concrete Bridges," prepared by the Bureau of Public Roads, was used for general design purposes with a few minor exceptions. "One of these exceptions," he said, "was the change to a maximum initial strand stress of 175,000 psi because of experience in stressing for the members used in the test bridge and at the suggestion of strand manufacturers."

Special Study

Because of the size of the project, he said that special study was required before the final design could proceed. "Of a total of 289 bridges on the entire project," Mr. Bender said, "the superstructures of 224 are carried wholly or in part by prestressed concrete stringers with spans varying up to 107 ft. Continuous design under live loads with prestressed cylindrical piles utilized to provide frame action over three and four spans was employed for 89 structures."

The entire project, it was shown, required approximately 448,000 lin. ft. of prestressed stringers. Four manufacturing contracts were made for furnishing the stringers. Other requirements include more than 19 million lin. ft. of 7/16-in. prestressing strands and more than 90,000 cu. yd. of concrete. Piers in 90 of the bridge structures will require the placing of more than 50,000 lin. ft. of 36-in. diameter cylindrical prestressed concrete piles.

Bid prices for the manufacture and delivery of prestressed members were given by Mr. Bender as follows:

36-in. girders . . . $11.20 per lin. ft.
48x24-in. girders . . $13.30 per lin. ft.
48x28-in. girders . . $15.25 per lin. ft.

His paper showed that a considerable reduction in total cost was achieved by the general use of prestressed concrete. Erection prices, Mr. Bender said, average $2.70 per lin. ft. for the 36-in. girders and $3.20 for the 48-in. girders. He also said that costs on superstructures were reduced 23 percent by the substitution of prestressed concrete stringers for steel members. Total figures, he said, showed unit costs of $13.10 per sq. ft. for the prestressed concrete bridge and $16.50 per sq. ft. for a steel structure, a difference of 21 percent.

Research Program

A six-year research program on prestressed concrete, undertaken by the University of Illinois, conference delegates were told, was started at the request of the Illinois Division of highways. Phases of that program, completed, in progress and planned, were reviewed by C. P. Siess, the university's research professor in Civil Engineering and M. A. Sozen, research associate in civil engineering, at the opening of the Friday, Aug. 2, session.

Prof. Siess said that in 1950 the division of highways asked the university to initiate a research program on prestressed concrete. The investigation, he said, covered the behavior and ultimate strength of beams failing in flexure; the behavior and ultimate strength of beams failing in diagonal tension or shear; time-dependent effects including relaxation of prestressing wire and changes in the camber or deflection of beams with lapse of time; and the inter-relationships among various design criteria for beams at service and ultimate loads. Several hundred rectangular and "I" beams were tested.

Prestressed concrete bridges under construction and two notable prestressing plants were visited by the conference delegates during an all-day field trip July 31. The visitors filled 21 motor buses. Many others made the trip in private automobiles. The plants visited were those of Ben C. Gerwick, Inc., at Petaluma and Basalt Rock Co. at Napa.

On the way to the Gerwick plant stops were made to witness prestressing work on the Richardson Bay bridge and the Forbes Overhead on Highway 101. Both bridges were designed by State of California engineers. Structural members on the Richardson Bay bridge included 270 T girders, each 80 ft. long and weighing 40 tons. These girders were made in the plant of the Basalt Rock Co. using the Freyssinet system of post-tensioning. Each girder contains 12 wires of .277 in. diameter. The total prestress force per girder was 567,800 lbs.

The Forbes Overhead structure comprised 72 hollow-core deck units, 44'11" long. These were pretensioned units made in the Ben C. Gerwick plant. Each unit

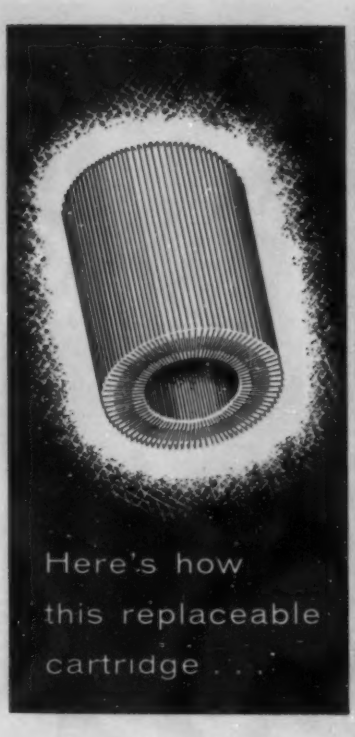
(Continued on page 136)

Prestressed Runway Design Being Studied

Some of the problems faced by the designer of airfield pavements for the use of military aircraft were discussed by Frank M. Mellinger, director, Ohio River division laboratories, U. S. Army Corps of Engineers, Cincinnati, Ohio. His paper opened the Thursday, Aug. 1, session on "Prestressed Pavements, Wharves, Piles and Dams."

Mr. Mellinger said that when the Corps of Engineers began studies of prestressed concrete several years ago, 100,000 lbs. was the heaviest load for which pavements at Air Force bases were being designed. This loading, he said, required plain concrete pavement 15 to 20 in. thick and overlays 8 to 15 in. thick to strengthen existing pavement. Now, he explained, the design load for heavy bombers has been increased to 240,000 lbs. and may soon be raised to 325,000 lbs. He also said there were prestressed concrete pavement designs to sustain heavy bomber aircraft with gross weights of more than 500,000 lbs.

Mr. Mellinger described a test track which the Corps is now building near Cincinnati. This will have doweled expansion joints beneath a 4-in. thick prestressed concrete overlay. One advantage of prestressed pavement for aircraft, he believed, would be elimination of troublesome joints and achievement of a smoother surface for landings and take-offs at high speeds. He said an added advantage is economy of materials and use of a minimum amount of heavy equipment in construction.



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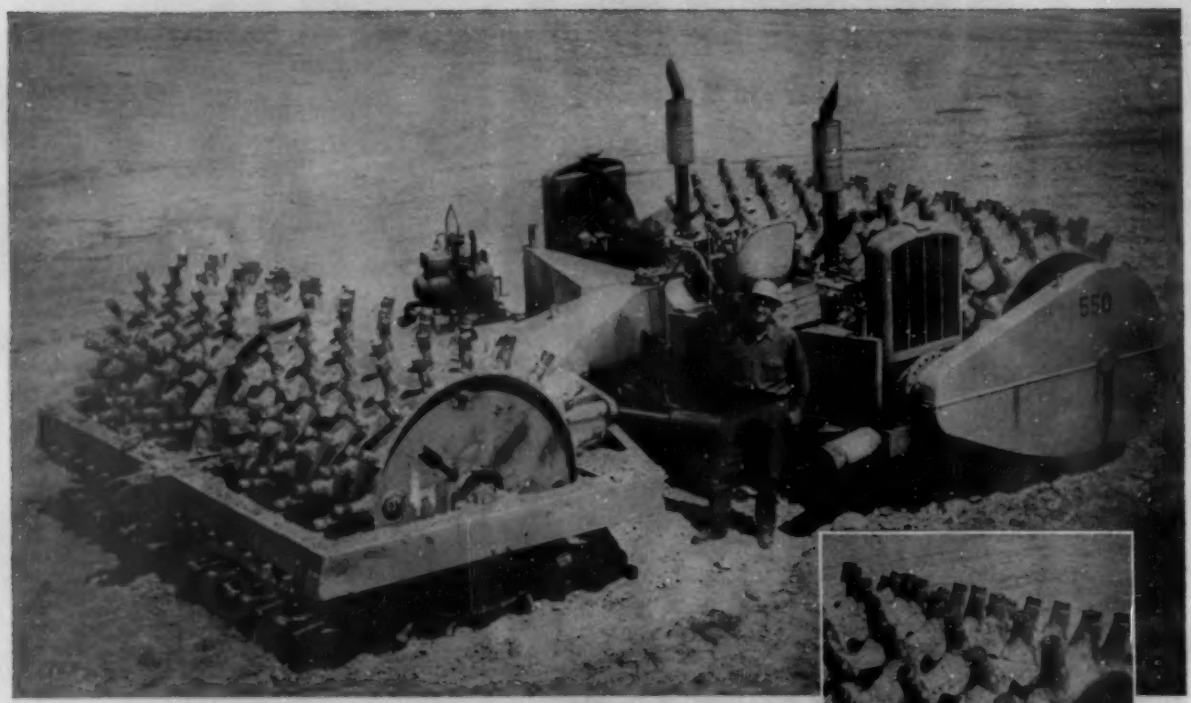

MORE SPEED WITH NEW COMPACTOR

Conventional compactors are not fast enough for the Mittry Construction Co. —so this firm designed and built the double drum monster shown above on a job in Santa Maria, California. Two 200 H.P. diesels drive the machine through torque converters at a speed up to 8 m.p.h.; hydraulic rams operate the steering mechanism. Bare weight is 75,000 pounds; with ballast, 100,000 pounds. This compactor is now doing the work of three ordinary pieces of equipment.

Since speed is the basic reason for this new machine, every factor that keeps it on the job and reduces down-time for repair or parts replacement has been given close consideration. For example, tamper feet might be expected to wear rapidly at high operating speeds; to cut such wear to a minimum the feet were treated to a band of Stoody 121 applied by the semi-automatic welder before the machine went into service. The inset photo above illustrates the appearance of the feet as hard-faced. There will be little "time out" for replacements here!

And on the subject of getting the most out of sheepsfoot tampers—here are two other commonly used methods of restoring worn feet. Both are illustrated at the right. The first method uses short lengths of pipe driven over the worn ends, the "cups" then being filled with deposits of Stoody 121 applied by the semi-automatic welder. This method of weld casting is extremely fast and the ring restores both size and height of the foot. On square shanks the ring may be welded first to close the bottom opening. This method has the advantage of saving time in removing the tamps from the machine.

The second procedure is the use of a split mold, either copper or carbon. The cavity above the stem approximates the original size and shape so the weldor simply fills in with Stoody 121. Gauge is restored automatically. Both methods provide far longer service life at very considerable savings.

The Stoody Guidebook covers hard-facing procedures for all types of heavy equipment. See your Stoody dealer (check the "Yellow Pages" of your phone book) or write direct to the company for a free copy.

Feet are kept out-to-size and with square edges by a single bead of Stoody 121 applied around the perimeter.

Fast repairs result without removing tamps from the machine by driving cups over the worn ends and filling with Stoody 121.

The carbon or copper split-mold surrounds the tamper and forms a cavity which is filled with Stoody 121 by the semi-automatic process.

STOODY COMPANY

11925 East Slauson Avenue • Whittier, California

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New Products —

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Pneumatic Roller With Oscillating Wheels

Under the name "Vertical-Pak," Southwest Welding & Mfg. Co., now offers a self-propelled pneumatic roller with vertically oscillating rear wheels, designed expressly to provide uniform compaction on uneven surfaces. The effect is especially important in work over soft spots or where stones or boulders are present, it is said. Excessive weight on any one tire or wheel is said to be impossible under normal operating conditions.

These units are available in 11-ton, 11-wheel models and 9-ton, 9-wheel models. Power is 50 hp either gasoline or diesel. Maximum speed, 15 mph. For complete information write Southwest Welding & Manufacturing Co., Construction Machinery Division, Alhambra, California.

For more details circle 101 on Enclosed Return Postal Card.

Southwest Roller

Broader, Lower Scraper its Easier Lifting

Lowbowl scraper design has now been made available for use with the Caterpillar D7 tractor. Announcement of the No. 435 Lowbowl scraper has been made by Caterpillar Tractor Co., Peoria, Ill.

The new, 4-wheel scraper has a low silhouette which allows material to enter the scraper with a minimum of lifting effort and material-to-material friction. On a comparative basis, the No. 435 scraper offers 38.6 sq. ft. of bottom area to 31.9 sq. ft. for the No. 70, an increase of 6.7 sq. ft. for the new scraper. This increase helps to provide the new unit with a struck capacity of 13 cu. yd., an increase of 27% over its predecessor model.

Because of its additional width, the No. 435 scraper provides a broader base for heap loading, and can transport 18 cu. yd. of heaped material.

For more details circle 102 on Enclosed Return Postal Card.

Caterpillar's Lowbowl Scraper

New Diesel Has Smooth Operation, Better Bearings

The Diesel Division of Harnischfeger Corp., Crystal Lake, Ill., is introducing a new connecting rod and piston design, stated to be the first of its type ever used in diesels —for its line of 2-cycle P&H diesel engines.

Termed a "Mushroom" rod and piston by Harnischfeger, the design utilizes a semi or half ball and socket coupling in place of the conventional wrist pin arrangement. Bearing area is increased up to 2½ times over pin type construction and is stated to provide smoother operation and longer bearing life. The hollow "Mushroom" rod carries an oil supply from the crankcase to the network of oil grooves in the top side of the rod bearing.

For more details circle 103 on Enclosed Return Postal Card.

Heater-Planer Lessens Work Fire Hazard

The Monatco heater-planer, a machine for one-pass reconditioning of asphalt streets, highways and

More New

Model M-2 Monatco Heater-Planer

airport runways, has been completely redesigned by the manufacturer, Monatco Manufacturing Corporation, 1401 Woodland, Kansas City, Mo.

Design goals were two-fold: (1) To engineer a machine for maximum efficiency and economy in this specialized work; (2) To remove all possibility that machine would catch fire or set fires while being operated.

New Monatco Model M-2 places main drive engine, primary transmission and steering over front axle, out of heat zone. Operator, fuel tanks, secondary transmission and final drive are well to rear of heat zone.

For more details circle 104 on Enclosed Return Postal Card.

New "Paymover" Tractors Have 5,000, 6,000 lb. Pull

The first two "Paymover" towing tractors for commercial use have been annouced by Towing Tractor section of The Frank G. Hough Co., Seventh Ave., Libertyville, Ill.

These new machines are the model T-50 with 5000-lb. drawbar pull and the model T-60 with 6000-lb. drawbar pull. Although models which will be introduced in the near future will include both two and four-wheel steer, four-wheel-drive machines, the T-50 and T-60 are two-wheel-drive models. The new units feature torque-converter drive and automatic transmissions.

For more details circle 105 on Enclosed Return Postal Card.

Hough Tractor

Dolly Brings Scrapers Within Legal Axle Limits

A new accessory for use with its model C Tournapull has been announced by LeTourneau-Westinghouse Co., Peoria, Ill. It is a convertible wheeled dolly which attaches quickly under the nose of the C size prime mover to bring the unit within legal axle limits for fast job-to-job roading.

Mounted Reisser Dolly

It features a simple 3-point hookup and can be attached to the prime mover in less than 10 minutes. An unusual feature of the unit is the convertability which makes it a dual purpose tool. Instead of being removed and laid aside to stand idle until the next equipment move, the dolly is easily transformed into a two-ton mobile utility crane. Hitched behind a panel or pick-up truck, it can handle any of a wide variety of hoist and carry assignments.

Products

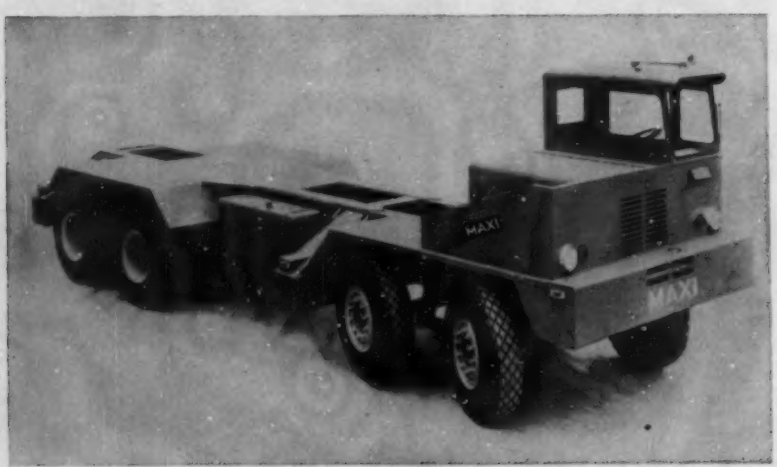
Further information and specifications on the Reisser Dolly-Crane are available by writing the Reisser Corp., P. O. Box 362, Blair, Neb., or by contacting local LeT-WesCo distributor.

For more details circle 106 on Enclosed Return Postal Card.

Truck Crane Carrier Has Tandem Front, Rear Axles

A new 35-ton truck crane carrier has been announced by The Maxi Corporation, P.O. Terminal Box 3129, Los Angeles 54, Calif. Two models are available to crane manufacturers, the T-84-F (8 x 4 drive) and T-64-F (6 x 4 drive). Among design features of importance to excavator and crane manufacturers are welded high-strength, alloy steel frame, removable outriggers with slide-type extensions both rear and midship, air assist on clutch, power steering, tow hooks front and rear, and extra large removable panel inside cab for better accessibility to left side of engine.

For more details circle 107 on Enclosed Return Postal Card.



Maxi Truck Crane Carrier

Pusher-Dozer-Ripper For Tight Spots

Advantages of the Balderson BD19 "Push Dozer" for Caterpillar D9 tractors are listed by the manufacturer as follows: Improved maneuverability in the pit; in-line pushing where close to banks and slopes; gouging banks and slopes is eliminated; narrow width helps in restricted work areas; effective as a pusher cup, yet retains dozer advantages; excellent rock dozers.

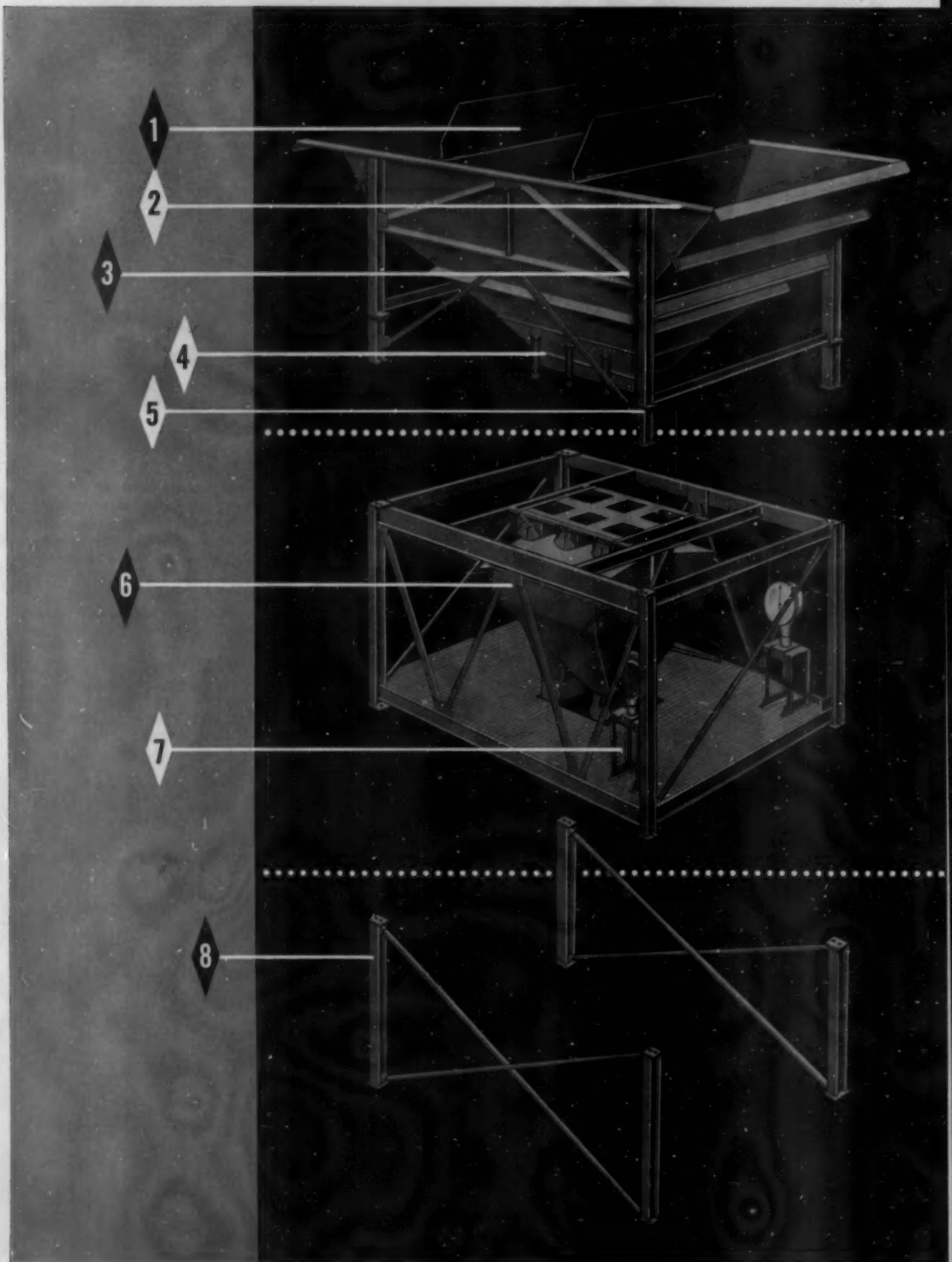
The inside-mounted, straight blade dozer has a cutting width of 10 ft. 2 in. which clears the width of the D9 tractor. Caterpillar No. 9S end bits make it an effective rock dozer because the narrow width allows more unit force on the cutting edge.

The Preco "Back-Ripper" is an

(Continued on page 130)

Balderson "Push Dozer"

Davis Crane (see page 130)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NEW HELTZEL ENGINEERED, UNITIZED PLANTS COMBINE "MINUTE-MAN" ASSEMBLY AND DISMANTLING WITHOUT SACRIFICING STRENGTH, RIGIDITY OR ACCURACY

HELTZEL, long a leader in quality batching plants, now offers you extreme portability without sacrifice of dependable accuracy or rugged strength.

Heltzel engineers have developed a completely unitized batching plant to meet the requirements suggested by many of the nation's foremost highway and airport contractors. The plant is fast, versatile, and extremely portable. It can be transported with standard highway equipment and assembled quickly with a minimum of labor. It is dismantled just as easily.

This unitized plant is fabricated in three easy-to-handle sections: The hopper section with folding heap plates (1), compartmentation to suit requirements (2), structurally reinforced — all welded construction (3), capacity to 200 tons, air electric controls with instantaneous coupling with manual standby controls (4). Straight manual controls available. Column connectors (5) are extra large for easy spotting and rapid assembly.

The batching or intermediate section comes completely factory assembled with single, dual or twin batchers fully automatic or manual (6) and time proved, ultra high speed Heltzel weighing system (7).

The support section is formed of rugged, yet easy-to-handle wide flange beams (8) with bracing furnished for drive through in either direction.

You'll want to know more about this portable plant that works with all the speed and accuracy of a modern stationary plant. Contact your Heltzel representative or write direct.

THE HELTZEL STEEL FORM AND IRON COMPANY

440 THOMAS RD., WARREN, OHIO

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. . . for more details circle 271 on enclosed return postal card

New Products

(Continued from page 127)

optional attachment at extra cost. Two or three may be built-in at the factory at time of fabrication.

Balderson Inc., Wamego, Kans. is maker.

For more details circle 108 on Enclosed Return Postal Card.

Hydraulic Excavator Crane Offers 360 deg. Swing

Featuring a completely hydraulic operated crane with 360 deg. swing, continuous rotation left or right, and road speeds up to 40 mph, the new model B-4 "Hydra-X-Cavator-Crane" is announced by Davis Engineering, Inc., of Benton Harbor, Mich. Turning radius is 17½ ft.; back hoe capacity, ⅜ cu. yd.; digging depth 11½ ft. The design provides especially for loading high-sided trucks. Shovel attachment is available.

For more details circle 109 on Enclosed Return Postal Card.

Drill Designed to Provide Complete Power Positioning

Gardner-Denver Company, Quincy, Ill., has announced a new model "Air Trac" drill, designed to provide complete power positioning of vertical, horizontal and flat lifter holes. A new hydraulic drill positioner, Model DPAT, provides 120° mast swing and can be indexed for an additional 90° swing. It provides 90° dump and can be indexed for a full 360° dump. Twin hydraulic cylinders provide a T-bar lift of 86° 30', which will bring the T-bar from below horizontal to nearly vertical.

Gardner-Denver's Drill

All controls on the drill for mast positioning, crawler drive and drilling, have been centralized on a single remote-control panel, providing fingertip control of all operations.

Other improvements include new jaw clutches on the drive shafts; a theft-proof tool box for storing tools, bits and couplings; and a driver's seat.

For more details circle 110 on Enclosed Return Postal Card.

Self Operated Spreader Can Be Mounted in 15 Minutes

A new sand spreader manufactured by Fox River Tractor Co., Appleton, Wis. is stated to convert an ordinary dump truck into a road spreader within 15 minutes and can be removed in the same amount of time.

Fox River Sand Spreader

Only one man is needed to operate the spreader over the road. Feed and throttle controls are within arm's-length of the driver while he is seated in the cab.

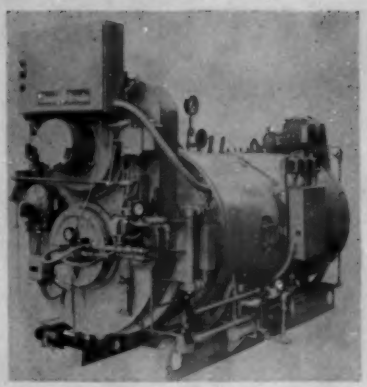
Uniform spreading action is based on the positive, steady flow of material to the spinner made possible by using an auger feed and is adjustable from 8 to 32 ft. Over-the-road speeds may range from 5 to 40 miles per hour.

Spreaders come in capacities (heaped) of 5, 5⅝, and 6¼ cu. yd. Five-yard box weighs 2280 lb. and are powered by a two-cylinder, air-cooled Wisconsin gasoline engine rated 14.6 hp at 2600 rpm.

For more details circle 111 on Enclosed Return Postal Card.

Oil Heater Gets Higher Temp Through Forced Circulation

A new direct fired oil heater said to heat transfer oils or other liquids to temperatures up to 600 deg.F., has been announced by Cleaver-Brooks Company, 326 E. Keefe Ave., Milwaukee, Wis. The heat transfer oils may be circulated through coils, molds, jacketed vessels and other heat exchange equipment to provide higher temperatures than can be economically obtained with high pressure steam, according to the company.



Cleaver-Brooks Oil Heater

Forced internal circulation design of the new industrial Peak-Temp oil heater provides high velocity flow of the heat transfer oil over the heating surfaces. Uniform oil temperature eliminates hot spots, coking or deterioration of the heat transfer oil. A simple fire brick ring in the burner throat is the only refractory used in this new design.

The industrial Peak-Temp heater, fired with oil, gas or combination oil/gas, is of the "closed" type and has the horizontal fire-tube design. This factory fire-tested unit is a complete package with removable heater element, integral forced draft fan and burner, and all necessary operating and safety controls. Heater element has a large vent at the top of the shell. The heater is used with an expansion tank and external circulating set.

For more details circle 112 on Enclosed Return Postal Card.

Improved Applicator for "Perma-Line" Has 3-Wheel Base

An improved applicator for applying the street marking material, "Perma Line," has been introduced by the Veon Corporation, Long Island, N.Y.

Featuring a new automatic bead dis-

Veon Perma-Liner

penser which evenly distributes reflectorizing glass beads to the surface of 3,500 ft. of traffic line, the new applicator, called the "Perma-Liner," has been developed to apply crosswalk lines right up to the curb edge, thus eliminating possible blank areas and later touch-up applications.

Another important modification of the "Perma-Liner" is a sturdy 3-wheel base in place of the previous 4 wheels. Besides greater maneuverability, freer wheeling and steering, the rear wheel has a locking device which insures non-wavering, completely straight lines. The wheels are provided with semi-pneumatic rubber tires.

For more details circle 113 on Enclosed Return Postal Card.

Pull Type Rotary Cutter Has Cutting Width of 100 in.

A rotary cutter featuring a cutting width of 100 in. has been introduced by Tractor and Implement Division, Ford Motor Corp., 2500 East Maple

Ford Rotary Cutter

Road, Birmingham, Mich.

Designed for use with all drawbar and power take-off equipped tractors of "three-plow" or greater power, the large pull-type rotary cutter is suitable for cutting down heavy brush, or maintaining parks and roadsides.

Cutting height can be adjusted from 2 in. above ground level to 11 in. by a linkage system which raises or lowers the implement's two gauge wheels. Regardless of cutting height, the entire unit remains parallel to the ground.

For more details circle 114 on Enclosed Return Postal Card.

Concrete Dissolvent Removes Old and New Deposits

Successful formulation of a liquid dissolvent for hardened concrete is announced by Industrial Synthetics Corp., 2000 West Walnut St., Chicago, Ill. The product, called "Disolvex," is a chemically compounded concentrate of organic and inorganic synthetics which work by catalytic action on the binding elements in the concrete, and commence to dissolve it immediately on contact. It is said to have no effect on the aggregates.

The chemical comes in concentrated form and will work on any known mix of concrete, no matter how old, excepting concrete mixed with rubber. It cannot be sprayed on objects to be cleaned, but must be used as a bath, with the liquid surrounding the objects at all times. Cleaning time varies with the strength of the solution and the age and thickness of the concrete. Usually it is from four hours for concrete up to ¼ in. thick and up to six months of age, to overnight for older concrete.

For more details circle 115 on Enclosed Return Postal Card.

Road Forms—All Types and Sizes for Fast Set-Up

Chain Belt Co., 4701 W. Greenfield Ave., Milwaukee 1, Wis., has broadened its "Rex" road form line. Included are both single and double-wedge types with specially designed standard slide locks to make them fully interchangeable. These forms are all-welded and fully reinforced, with no bolts or rivets. The top flange gives a full 2-in. tread for maximum strength and traction of form traveling equipment.

For more details circle 116 on Enclosed Return Postal Card.

60 Foot Erection Boom Performs Wide Range of Jobs

Here shown is a Model EB-142 boom manufactured by Superior Equipment Co., Bucyrus, Ohio, mounted on an International Harvester Tractor TD-14-142 series. According to the manufacturer's claims, it provides a relatively low cost construction unit capable of performing a wide range of jobs—from steel setting to storage tank erecting and other lifting jobs where only a crawler tractor can operate successfully.

With 3,000 lb. of counterweight this outfit can lift up to 14,000 lb. with an overhang of 8 ft. from rail, according

Superior 60-foot Boom

to published specifications. Winch mounting permits raising or lowering the boom or load while tractor is in motion. The load may be dropped instantly should tractor start to overturn.

For more details circle 117 on Enclosed Return Postal Card.

New Line of Dump Trailers to Meet Varied Needs

A complete line of dump trailers, with body capacities ranging up to 25 tons, body weights from 12 to 72 in., and lengths from 14 to 24 ft. is announced by Trailmobile, Inc., Cincinnati 9, Ohio. A full selection of piston or telescopic lifting mechanisms will be available. Hoist arrangements include

Trailmobile Unit with Twin Hoist

front mount telescopic, twin telescopic underbody, single telescopic underbody and twin piston underbody. Chassis weights are variable to meet requirements. Axles either single or tandem.

For more details circle 118 on Enclosed Return Postal Card.

New Pipe Pusher Unit Has 6 Inch Driving Stroke

A new attachment, custom-built for the hydraulic backhoe of the Henry Manufacturing Co., 1700 N. Clay St., Topeka, Kans., drives pipes or service lines under roads, sidewalks or lawns. Called the Henry "Ram-A-Rod," this pipe pusher will push or pull ¾-in. to 3-in. pipe or tubing.

The "Ram-A-Rod" is a compact unit, approximately 53 in. long and 14 in. wide, which replaces the bucket on the backhoe. The Henry hydraulic system and ground-rooted mainframe hold the pipe pusher in a fixed position. The bucket cylinder provides the actuating power.

The new pipe pusher has a 6-in. driving stroke and will deliver approximately 30 tons of pressure on the push pipe. The backhoe's stability gives the "Ram-A-Rod" unusual accuracy. Relatively small operating and target trenches are needed (approximately 4 ft. longer than pipe sections used.) The pusher reverses direction instantly. Be-

Henry Pipe Pusher

cause of its ability to pull pipe out quickly if a major obstruction is encountered, it is never necessary to cut pipe off and leave it in the hole.

For more details circle 119 on Enclosed Return Postal Card.

New Aggregate Plants with 3 or 5 Compartments Introduced

Two aggregate plants recently introduced by the Construction Equipment Div., Mattoon, Ill., of the Blaw-Knox Company are now available.

The P-3150 GAC has three equal compartments, each rated at 50-tons capacity, or 33-cu. yd. heaped. This plant is especially designed for paving jobs where a separate cement plant is required.

The P-5150 GAC is a five compartment plant with four bins for aggregates and one for cement. The cement compartment is rated at 225 bbls. while the aggregate capacity is 28 tons for each compartment. This assembly is designed especially for ready-mix plants, one-stop block plants and concrete paving plants.

For more details circle 120 on Enclosed Return Postal Card.

New Sidewalk Grader Saves Time, Material and Labor

A new light-weight sidewalk grader, announced by Lite-Weight Tool & Manufacturing Co., 11422 Fleetwood St., Sun Valley, Calif., is claimed to save time, materials and labor. The Easy-Roll grader is made of magnesium and has dirt-free, bronze lubricated bearings. It comes in standard sidewalk widths, the 4-ft. width weighing 10½ lb. and the 5 ft. width, 11½ lb. The maximum depth of cut of 3 in. may be lessened by the removal of washers. End rollers prevent binding on guide rails.

Easy-Roll Grader

For more details circle 121 on Enclosed Return Postal Card.

Worn Gear Screw Jacks Can Be Used in Any Position

The Joyce-Cridland Co., 2027 E. First St., Dayton, Ohio, announces its new worm gear screw jacks which can be used in any position and are designed for precision jacking, pushing and pulling operations and for linear actuation.

Joyce-Cridland Jack

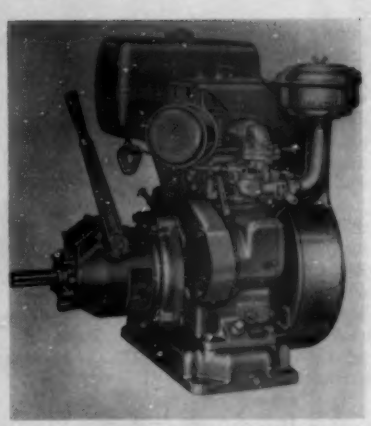
Jack shown has a 15-ton capacity, with travel to suit requirements. Jack housing is 8⅞ in. long, 7⅛ in. wide and 8¾ in. high, and worm gear ratio is 8 to 1, with 32 revolutions of the worm giving one inch of travel. Power source can be either manual or motor with reducer unit.

The 2-in. diameter jack screw, made of medium carbon steel, is actuated by an aluminum bronze nut which is cast integrally with the worm gear and mounted between two anti-friction thrust bearings to withstand bi-directional vertical loads. This gear is driven by an alloy steel worm mounted on tapered roller bearings.

For more details circle 122 on Enclosed Return Postal Card.

New Single Cylinder Engines Gives 12½ hp Heavy Duty

Wisconsin Motor Corp., 606 W. Wisconsin Ave., Milwaukee 3, Wis., is currently announcing a new 4-cycle single cylinder engine, the Model AGN, rated at 12½ hp., with a speed range from 1600 to 3200 rpm and a piston displacement of 38.5 cu. in. Early Fall delivery is scheduled.



Wisconsin Motor's AGN Engine

Listed as an outstanding characteristic is a basic high torque which provides the load-holding lugging power that resists rpm slowdowns under sudden shock loads, prevents stalling, and permits a quick power recovery.

For more details circle 123 on Enclosed Return Postal Card.

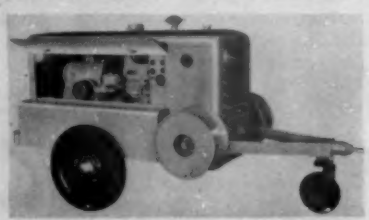
Sulfonates for Emulsions, Sprays and Other Uses

L. Sonneborn Sons, Inc., 300 Fourth Ave., New York 10, N.Y., has announced a new line of petroleum sulfonates for the emulsification and dispersion of liquids and the dispersion and wetting of solids and liquid-solid systems. Samples of the new products, known as "Duonates," may be obtained from the manufacturer.

For more details circle 124 on Enclosed Return Postal Card.

Compressor Has Free-Floating Rotor, Uses Less Fuel

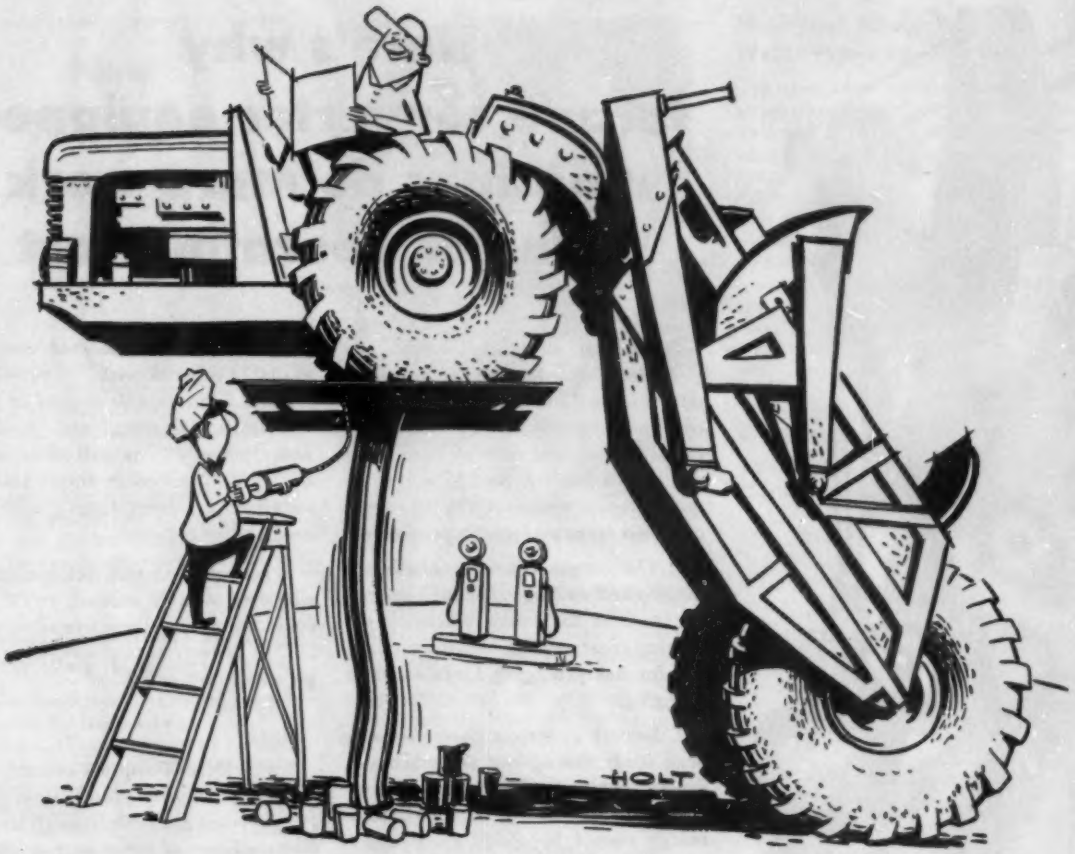
A new cfm rotary compressor has been announced by Davey Compressor Co., Kent, Ohio.



Davey Hydrovane Rotary

Known as the Davey Hydrovane Rotary 125, the unit is said to be the only multi-stage rotary compressor with a single free-floating rotor. The latter is so located that it is constantly concentric with one side only of the stator. Its blades are of the segmented type, inserted radially in longitudinal slots. They move continuously in a straight

(Continued on page 135)



Why use automobile grease in heavy-duty equipment?

Let's not kid ourselves about the difference between the lubrication requirements of automobiles and heavy-duty machinery. D-A Lubricants are compounded specifically for heavy-duty equipment. There is a right one for every application.

For example, D-A Track Roller Lubricant • D-A Type AC Track Roller Lubricant • D-A Winter Track Roller Lubricant • D-A Open Gear • D-A Torque Fluid • D-A Lithium, Extra-Heavy.

Let your D-A Representative give you all the facts on how D-A Lubricants can reduce parts wear and minimize downtime . . . *increase the return on your equipment investment.*

D-A Lubricants make equipment last longer

D-A LUBRICANT COMPANY, INC. • Indianapolis 23, Indiana

. . . for more details circle 256 on enclosed return postal card

Here's why torque converter equipped machines do *more* work at *lower* operating cost

For higher work capacity on any given load, and for greater all-round daily production, more and more contractors are specifying torque converter drives in their new excavators, erecting cranes and loaders. And here are five good, profitable reasons why the torque converter is the preferred type of drive:

1. The torque converter eliminates lugging and stalling . . . permits engines to work at maximum efficiency delivering constant high-horsepower output for heavy digging loads and fast swinging.

2. *Smooth* converter power reduces peak loads throughout the machine's drive train because fluid within the converter absorbs much of the impact energy caused by quick drum speed change . . . thus protecting *both* driving and driven equipment.

3. When necessary, the torque converter smoothly delivers approximately twice normal torque to the drum, which, at slow digging speeds, represents an important advantage in power delivered to the dipper.

4. Cable life is extended since no sharp impact loads ever reach cables through the torque converter . . . constant line tension is maintained . . . there's no jerking or snapping.

5. An infinite variety of ratios is available to work with . . . permitting smooth, accurate, *safe control* of loads and delicate "inching" and "holding" under power . . . as well as adjusting for wide variations in dipper loading, substituting greater digging effort for speed, when required.

Wherever earth and rock are moved, wherever steel is erected, you'll find contractors using these five advantages . . . *to convert their horsepower into greater-than-ever profits!*

• • •

Twin Disc Torque Converters—*three-stage* or *single-stage*, from 30 to 1000 hp—are available from all leading manufacturers of heavy-duty machines. Be sure to specify one in your next unit. Take advantage of the five reasons why torque converter equipped machines do *more* work at *lower* operating cost.

Twin Disc is the world's leading manufacturer of friction clutches and fluid couplings for heavy-duty industrial applications . . . and the only manufacturer producing *both* three-stage *and* single-stage torque converters. Because of its complete line of industrial drives, Twin Disc can offer *unbiased* recommendations for any heavy-duty power transmission application.

TWIN DISC

TWIN DISC

Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES OR SALES ENGINEERING OFFICES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • TULSA

. . . for more details circle 310 on enclosed return postal card

New Products

(Continued from page 132)

line from the stator center and cannot "cock" or bind.

While rotor turns and compression continues, cooling oil is injected by means of 2 multi-stage cooling oil injection chambers. The manufacturer states this produces continuous cooling action that lowers air discharge temperatures as much as 100° below other compressors. Multi-staging is also said to reduce the engine horsepower required to operate the compressor, thus delivering more air from less fuel. Volumetric efficiencies up to 92% are claimed for the new unit.

For more details circle 125 on Enclosed Return Postal Card.

Lightweight Underbody Hoist Features Weight Savings

A new underbody telescopic hoist, announced by Hercules Steel Products Co., Galion, Ohio, is designed for field conversion installation under platform and other types of farm and general purpose bodies.

The new hoist, deignated model 2240, features strong, light weight construction with an impressive saving in hoist weight, plus forward mounting on the truck chassis to minimize truck frame deflection during dumping.

With a rated capacity of up to 11 tons, the new hoist is intended for use under bodies up to 14 ft. in length. It is suitable for 1½ to 2-ton chassis with an 84-in. CA dimension. Dumping angle is 45°. Optional longitudinals, Z-type for bodies with wooden longitudinals and channel for bodies with steel crossmembers, are offered. Hoist subframe is ¼-in. formed alloy steel. The hoist package includes a built-in reservoir, positive-acting control valve and high-speed gear-type pump.

For more details circle 126 on Enclosed Return Postal Card.

Radio Gauge for Quick Data on Moisture and Density

The "d/M-Gauge" for rapid measurement of moisture content or density in a wide range of organic and inorganic materials has been announced by Nuclear-Chicago Corp., 229 W. Erie St., Chicago 10, Ill. With it, states the manufacturer, a single operator can obtain accurate moisture or density determinations in two minutes.

The operational principle is based on the varying degree that radioactivity is "scattered" when placed in contact with masses of different moisture content or density. The company's announcement stresses the substantial volume of material tested in a single operation; and states that the probes normally measure a spherical volume of material with an average diameter of 14 in. Moisture or density measurements, it states, can be made at any depth, ranging from the top 12 in. to 60 ft. below the surface.

Nuclear-Chicago "d/M-Gauge"

For more details circle 127 on Enclosed Return Postal Card.

New Troweler Features Four Float and Finish Blades

The White Manufacturing Company, Elkhart 2, Indiana, announces a new 36-in. troweler, Model T-4 with 2¾-hp engine. Featured are four combination float and finish blades for quicker smoother troweling with greater stability. Still retained is the exclusive patented feature of the blade mounting whereby blades can be removed quickly for easy cleaning or for reversal for extra wear without the use of tools.

The ring unlatches easily for moving the troweler through narrow doors on its retractable wheel. There is complete one-man portability.

White's Model T-4 Troweler

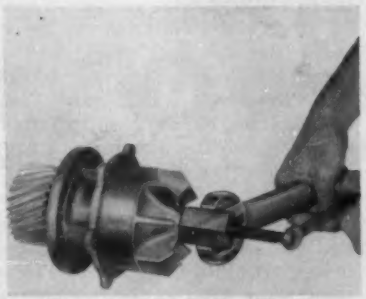
For more details circle 128 on Enclosed Return Postal Card.

New Tool Safety Removes Water Pump Impellers

A new tool, developed to remove water pump impellers from their shafts on various Allis Chalmers engines has been announced by Owatonna Tool Company. Since the impeller shoulder fits snug against the housing cover it is generally impractical to use a jaw pulling tool for removal. The new AC-20 tool simply threads on the impeller hub and the forcing screw bears against the impeller shaft. By turning the forcing screw and holding the large hub collar, removal is accomplished with little effort or danger of parts damage.

The tool fits the following Allis-Chalmers Engines:

Allis Chalmers Engine Model No.	Allis Chalmers Equipment Model
HD-844	HD-16A Tractor
HD-844C	HD-16AC Tractor (With Torque Converter)



How the OTC Puller Works

HDS-844	HD-21 Tractor
TD-844	TS-260 Motor Scraper
TDS-844	TS-360 Motor Scraper

Complete details are available from OTC distributors or from Owatonna Tool Company, 417 Cedar Street, Owatonna, Minnesota.

For more details circle 129 on Enclosed Return Postal Card.

New Truck and Bus Engines Provide Operating Economies

A new line of diesel engines, series 71E and 71T, for trucks and busses has been announced by the Detroit Diesel Engine Division, General Motors Corp., 13400 W. Outer Drive, Detroit 28, Mich. They are available to manufacturers for installation as original equipment in 4 and 6-cylinder models. It is claimed they will afford the most economical operation and maintenance the transportation industry has ever had, due to improved combustion and freer engine breathing, resulting in lower fuel costs per mile, less maintenance, and substantially longer life.

The series E engines will power trucks and busses ranging from 26,000-lb. to 60,000-lb. gross vehicle weight and up. Four exhaust valves per cyl-

(Continued on page 139)

PRESTRESSED CONCRETE

(Continued from page 122)

weighed 19 tons and contained 50 7-wire strands of ⅜-in. diameter. Of the 50 strands, 26 were deflected and 24 were straight.

Loading and bending tests on four 16-in. diameter hexagonal pretensioned piles were witnessed at the Gerwick plant. One pile was tested under a sustained load of 200 tons. Under this load the pile settled ⅜ in. and returned to a final settlement of 1/16 in. after removal of the load. None of the four piles showed any movement under a vertical load of 50 tons. A bending pressure of 630,000 inch-pounds applied to one pile showed no evidence of distress.

The Gerwick plant produces prestressed concrete piling in lengths up to 132 ft; bridge girders in both "I" and "T" sections up to 105 ft. spans; flat slab deck units, channel units, building beams and double T sections in 20 to 55 ft. spans. Concrete for the Gerwick operations is supplied by the Petaluma Ready Mix Co. with a plant close by.

Leaving the Gerwick plant, the conference party's next stop was at the site of the Petaluma Creek bridge on State Highway 37. Here the visitors witnessed the driving of a composite concrete and steel pile 195 ft. long, designed for a 200-ton load. A Vulcan 14-C hammer with a 14,000 lb. ram was used. The Gerwick plant is making the girders and piles for the Petaluma Creek project. The design calls for 264 T girders 80-ft. long, weighing 32 tons and designed for pretensioning. These girders contain 18 7-wire straight strands and 18 deflected strands. Wire is 7/16-in. diameter.

Next Month's Issue

A Portfolio of Prestressed Concrete Jobs

Bridges recently under construction in various states, will be described with pictures showing the various methods the contractors are using today to transport, handle and set precast piling, cap beams, deck beams and half-deck or whole-deck units, weighing sometimes up to nearly 100 tons.

At noon the more than 1,200 conference visitors were luncheon guests of the Basalt Rock Company's structural concrete products division at the Napa plant. All the guests were seated at long rows of prestressed double "T" slabs which made convenient dining tables.

Most of the prestressing beds of the Basalt plant are under roof in a building 65x1,000 ft. which is equipped with two 30-ton bridge cranes.

On the way back to San Francisco the party saw the Hercules overpass on U.S. Highway 40, a project requiring 136 "T" girders, 79 ft. long and weighing 38 tons. These were post-tensioned in the Basalt plant by the "Stresteel" system utilizing seven 1⅛-in. diameter bars. The prestressing force is 550,000 lbs. per girder.

Virginia: Consider Effect of Terrain on Road Costs

Distribution formulas for highway funds within a state have been on many different bases, with the factors of population, highway mileage and other traditional yard sticks used, as well as arbitrary spread-ups made by the state legislatures.

A new twist is proposed in Virginia: Consider the nature of the terrain and its effect on road construction costs in allocating funds. A delegation from Roanoke in the mountainous area of the state has proposed this to the Virginia state highway department, making the logical plea that a mile of highway on the average costs more to build in the Roanoke region than in the flat part of the state and, therefore, a differential should be considered.

Earth Safety Mound Built Along Parkway Median

One of the most unusual center island safety barriers ever constructed is the mound placed along the state-owned section of the Garden State Parkway. The project, covering 11.6 miles, was built last year as an experiment to reduce headlight glare from opposing traffic and to eliminate the possibility of head-on collisions.

The mound which was built by contract consisted of an earthen barrier, in the median strip between parkway roadways, extending 4 ft. above the pavement. The bottom part of the mound consists of heavy clayey material covered by 6 in. of top soil, placed in width of 12 to 14 ft. State specifications called for the top of the mound to be 8 ft. off the pavement where the median is 24 ft. wide. The top vertical curve of the mound is 4 ft. wide. The job was bid at $160,335 by J. F. Chapman & Son, contractor.

As part of the project, the highway department provided for widening the shoulders on the outer side of both roadways to 10 ft. The center island in the area was previously narrowed during the 1955 summer when the stretch from the Raritan River bridge to Route 22 was widened from two to three lanes for each direction of traffic.

● **Earth mound nearing completion on New Jersey department's section of Garden State Parkway.**

Technical Digest

by John C. Black

How Officials Can Help Contractors and Themselves

A panel discussion brought unanimous agreement that contract provisions and contractor-engineer-commissioner relations are subject to practical improvements and large savings to all parties. Published report of the discussion fills 21 pages. Following are a few selected and condensed items.

LeRoy Kern, Harry T. Campbell Sons Corp., Maryland:

Two of the most serious "man-made obstacles" are insufficiency of funds and violently fluctuating programs. Advertising schedules were neither well-timed nor integrated. At times they accentuated the feast or famine cycles. Acquisition of rights of way delayed contract awards and notices to proceed. Delays in releasing those rights of way which often remained to be released after contractors were notified to proceed, plus delays in getting utilities out of the way, disrupted operating schedules and occasionally caused complete shutdowns.

Frequent revisions in plans and specifications and difficulties in obtaining prompt decisions increased with volume of work. Large sums owed to contractors for work performed were tied up for indefinite periods by a combination of retained percentages and delays in final settlement.

Burl A. Wilder, general supt., Savin Construction Co., Connecticut: The day when the resident engineer ran his job for the state with the same responsibility, personal interest and judgment as the superintendent runs his job for the contractor is probably gone forever. With its passing has gone the cheapest method of administering a project.

When either the resident engineer or the superintendent has to send six copies to six different persons and the decisions, approvals and comments have to work their way back to the field, the costs have increased on both sides. When one more department becomes involved it means another engineer to process the mail, another stenographer, another file, another office, another car, etc. It also means added costs to the contractor which will appear on your next bid whether you like it or not.

In the past your district engineer had walked every job before it was designed or let and he knew the difficulties which would be encountered. When the resident engineer called him, a decision was made on the spot.

Great savings can result from more care in design, especially of bridges and culverts. The detailer often can save $10 per yard in form costs. Much can be saved by the simple expedient of establishing standards and sending them to each contractor ahead of the asking for bids so that he may anticipate the use of steel forms, catch basins, etc., which would have a value for the whole project.

You are spending large sums to have the contractors furnish borrow for roads. If you will buy wider rights of way, widen cuts, or purchase borrow pits when purchasing rights of way, you can save hundreds of thousands of dollars. After a job is let, the adjacent property owners have top hand of the contractor and he cannot gamble on items of this size. He must bid surely and therefore high.

What to do about these things? I would equip a practical engineer with a red pencil and have him go thru every job before bidding, cut out the expensive unnecessary things, make simple structures, and do all possible to provide the job with materials from reasonable sources."

Philip V. Corey, president, W. H. Hinman Company, Maine: Ignorance and lack of right spirit and interest of foremen and inspectors produce much avoidable waste. Better education and training are the answers. Highway departments might well have a policy that the resident engineer and foreman have periodic meetings and discuss what is going on.

Get Ready for Winter Patching
with the
NEW & IMPROVED . . .
Model 30-R
HEAT-A-MIX
TAILGATE ASPHALT MIXER
• For heating and remixing stockpiled asphalt.
• Can be operated in forward and reverse.
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. . . For more details circle 321 on enclosed return postal card

Fred Hauck, design engineer, Rhode Island: "I would like to ask the contractors just how much responsibility they would like to assume on the field level of engineering?"

Corey in reply: "I would say we would do all the engineering and would like to do it; that is, pick up the basic data and look after it."

"The Contractor's Side of the Highway Program," B. D. Tallamay, Chairman New York State Thruway Authority, Moderator of Panel. Proceedings of the Thirty-second Annual Convention, Association of Highway Officials of the North Atlantic States, 1035 Parkway Ave., Trenton, N. J., 1956.

Vehicle Taxes For Nine States Studied and Compared

Relative tax responsibility of vehicles according to size and weight presents a vexatious question, an approach to which is here made in a study of information from the nine states for which practical comparative data is available.

An appendix gives a list of the state highway finance and taxation studies which provided the data for the analysis.

Synopsis: "The findings of highway tax studies made in nine states are compared in this article in terms of the tax payments that would be required of eight vehicles or vehicle combinations under the recommended user-tax schedules. Comparative data on the payments that would be made under existing tax laws are also given. The payments are expressed in terms of payments per year, payments per mile of travel, and payments per gross ton-mile.

"As might be expected, there is considerable variation from state to state in the recommended user-tax payments for each of the eight vehicles. Nevertheless there is a marked central tendency in that the study findings, particularly those for heavy vehicles, tend to group within relatively narrow intervals.

"The median or 'middle' values of the required tax payments per year are $340 for the light passenger car, $1,229 for the 4-axle tractor-semitrailer combination, and $1,836 for the 5-axle tractor-semitrailer-trailer combination. Expressed as indexes of the passenger-car payment, the values for the three vehicles are 1.0, 30.7, and 45.9.

"Median tax payments per mile of travel are 0.43 cents for the passenger car, 3.07 cents for the 4-axle tractor-semitrailer combination and 3.67 cents for the tractor-semitrailer-trailer combination. The indexes are 1.0, 7.15, and 8.54. "The trend of median tax payments per gross ton-mile is downward, dropping from 2.2 mills for the passenger car to 1.2 mills for the 4-axle tractor-semitrailer combination and 1 mill for the 5-txle tractor-semitrailer-trailer combination. The median indexes of required tax payments per ton-mile are 1.0, 0.55, and 0.46."

"Highway-User Tax Schedules Recommended in State Highway Finance Studies" by the Financial and Administrative Research Branch Bureau of Public Roads, reported by G. P. St. Clair, Chief of Branch, and Hugo C. Duzan, Transportation Economist. Public Roads, Bureau of Public Roads, Washington 25, D. C., October, 1956. (Available at 20 cents per copy from Superintendent of Documents, Government Printing Office, Washington 25, D. C.)

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ONLY BMCO'S NEW VIBRATING ROLLER HAS ALL THESE FEATURES:

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... for more details circle 244 on enclosed return postal card

New Products

(Continued from page 135)

inder, instead of the conventional two, insure the expelling of all exhaust gases. An increase of 38% in the cylinder liners' air inlet area will result in cooler piston operation and longer engine life. The 4 cylinder 71-E has a basic brake horsepower rating of 140-hp at 2100 rpm; the 6-cylinder is rated at 210 hp. at 2100 rpm.

The 71-T series includes a turbocharger operated by the engine's exhaust gases. Trucks testing this engine in the six-cylinder model are reported as having mileage by as much as 15%.

For more details circle 130 on Enclosed Return Postal Card.

Remote Control Air Clutch With Non-leak Diaphargm

Twin Disc Clutch Company, Racine, Wis., recently announced the addition of 8-in., 10-in. and 11½-in. sizes to its line of "PO" air clutches. They are available in triple-plate, double-plate and single-plate construction and have a maximum torque capacity of 3,503 lb-ft. An exclusive feature is the cartridge-type diaphragm constructed of neophrene reinforced with nylon, and designed to eliminate leakage. Another feature is constant torque capacity without adjustment.

These clutches are designed for the convenience of remote air control wherever desired. Among uses listed are rock crushers, tractor winches, pipe-extruding machines, drilling rigs, machine tools, pug mills and other equipment.

For more details circle 131 on Enclosed Return Postal Card.

Sign Letter Withstands Any Weather

Following the equivalent of three years of "on-the-road" testing under all weather and climatic conditions, a new reflectorized, demountable cut-out sign letter is offered by Traffic & Street Sign Co., 84 Foundry St., Newark, N.J. It is designed to equal the latest criteria for daytime legibility combined with a nighttime reflectorized stroke width equal to Bureau of Public Roads Series "C." Structurally, the sign is of high strength, aircraft-type aluminum, alodized and finished in triple-coat baked enamel, with reflectorization superimposed. Letters, numerals or symbols are mounted flat on either wood or metal backings.

For more details circle 132 on Enclosed Return Postal Card.

Engineers' Rod Has Unique Clamping Device

A new engineers' and builders' rod made of three pieces of selected, seasoned magnolia wood which is light, strong and will not warp, has been introduced by David White Instrument Co., 2051 N. 19th St., Milwaukee 5, Wis.

Each section is highly polished with a natural finish and is 2½ in. wide, 1⅛ in. thick and 5 ft. long. The rod has a 14 ft. working surface when fully extended. Graduations are large and easy to read, in feet, inches and eighths on replaceable tape. The curved surface of the white face prevents reflections. Foot numbers are in red, and inches in black.

For more details circle 133 on Enclosed Return Postal Card.

New Tire Provides Speed, Safety and Long Life

The "Silvertown 125", a new tubeless passenger tire, featured as giving safety at high speed and long life at regular speeds, is announced by B. F. Goodrich Tire Co., Akron, Ohio.

It is stated that this tire not only provides safety and economy for turnpike and other "normal high speed" driving, but continues safe through the excessive speeds often required by law enforcement officers, and therefore has special adaptation to police vehicles.

In construction, the "125" has six nylon plies, which prevent the formation of a "shock or standing wave" before a relatively high speed has been reached. The tread, unlike that of racing tires, has the same dpth found in standard tires, thus enabling it to deliver the same mileage and wear in normal driving.

For more details circle 134 on Enclosed Return Postal Card.

(Continued on page 134)

Versatile Reversible!

The NEW **FRINK**

TRIP-BLADE SNO-PLOW

for all-purpose snow removal

Here's the plow designed to cope with almost every snow removal problem. The new Frink Reversible Sno-Plow with Trip Blade plows left or right for in-city maneuverability . . . bulldozes straight ahead for clearing intersections, bridges, lanes, parking lots, airport ramps and wide sidewalks. Power hydraulic mechanism, controlled by cab lever, reverses plow while raised or on ground, even while plowing. (Models with manual reverse by single lock pin also available.) Curved, panelled moldboard with deflector makes the Reversible lighter and safer to use at all speeds.

PRE-LOADED TRIP SPRING MECHANISM

Dual-purpose springs with special linkage to moldboard create "free-flowing" action that follows road contour, produces smooth tripping over obstructions and quick, cushioned rebound without chatter. Cutting edge and plow shoes are replaceable; scuff shoes bolted outside moldboard protect against curbs, side obstructions.

Other dependable Frink Sno-Plows (V-Type, One-Way and Roll-Over) are interchangeable on trucks with attachments for the Reversible.

For Snow Plow Know-How It Pays to Think of FRINK SNO-PLOWS

Clayton, 1000 Islands, N. Y.

Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

. . . for more details circle 262 on enclosed return postal card

Court Decisions
Contractors Should Know

Prime and Subcontractor Joint Liability on Paving Job

Provision in a contract for highway paving and the construction of a bridge, between the Georgia state highway department and a road contractor, was that, "Barricades shall be kept well painted and suitable warning signs shall be illuminated at night and all lights and devices for this purpose shall be kept burning from sunset to sunrise."

In its defense to an action for the death of an automobile passenger, caused by the absence of such warning signs, the contractor set up that the work had been subcontracted, that its performance was under the sole control of the subcontractor and that as this subcontractor's negligence was the only violation of this contract provision the prime contractor was not liable for damages.

Holding both prime and subcontractor liable the Georgia court said of the law governing the duty of both contractor and subcontractor, "Where one company enters into a contract with the state highway department to do construction work on the public highways of this state and lets out a part of the contract to another company, the relation of contractor and subcontractor exists between the two and they may be jointly liable for injury resulting from negligence."

Holland v. Phillips. 94 S.E. 2d 503, Georgia, September 21, 1956

Independent Contractor

Contract for the paving of Tinker Field at Oklahoma City had been made by the Imperial Paving Company. That company had then engaged the owner of two trucks equipped to haul asphalt on a per mile per ton basis. Drivers of the trucks, hired by the truck owner, were paid as wages one third of the earnings of their particular truck on this job.

While engaged in cleaning the bed of his truck of the asphalt after dumping the load, one of these truck drivers slipped and fell, injuring his knee and back and became temporarily but totally disabled. Compensation was awarded the injured employee against the paving company and from that award the company appealed, contending that the owner of the trucks and not the paving company was the employer.

In settling this award aside the Oklahoma Supreme Court said that this man at the time he sustained his injury was employed, not by the paving company, but by the owner of the truck. Holding the truck owner an independent contractor the court said,

"An independent contractor is one who is engaged to perform a certain service for another according to his own manner and method, free from the control and direction of his employer in all matters connected with the performance of the service, except as to the result or product of the work."

Then of the incidental instructions given by the paving company in the loading and disposition of the asphalt, the court added, "An independent contractor is always subject to the direction of the principal as to the result or progress of the work as distinguished from the method to be used in its performance."

Imperial Paving Co. v. Russell, 308 Pac. 2d 278, Oklahoma, March 5, 1957.

Lien for Equipment Repairs

Under a machine lease agreement, a dealer in heavy road equipment rented four caterpillar tractors, two caterpillar scrapers and two bulldozer blades, attached to two of the tractors, for 90 days, with provision for extension for three month periods on notice, for $5,376 per month.

No rent for the equipment was paid after the expiration of the first six months and the machinery was repossessed by the owner eight months later. In proceedings brought by the equipment owner against the surety on the general contractor's bond, $14,718.60 was claimed for repairs and replacements in addition to the agreed rental.

The Massachusetts court in refusing to allow a lien for this replacement and repair expense held that the cost of the labor and material incurred in the repairing of the equipment which had been furnished under this lease for use in this construction program could no more be the subject of a lien by the owner of the equipment than if it had been incurred by the contractor and lessee. Cost of repairs for damage to leased property, said the court, is not a part of the rent secured by the contractor's bond on a job for which he rents the equipment.

Cohen v. Henry N. Worthington Co., 136 N.E. 2d 237, Massachusetts, July 27, 1956

Wage and Hour Demands

Suit against an Iowa firm of consulting engineers by the federal Department of Labor for what was claimed to be a violation of the Fair Labor Standards Act in failing to pay employees time-and-a-half overtime compensation, was recently before the United States Court of Appeals for review.

For the period from 1950 to 1953 this firm had been engaged in the preparation of plans and specifications for the paving of approximately 37 sections of streets in four Iowa towns.

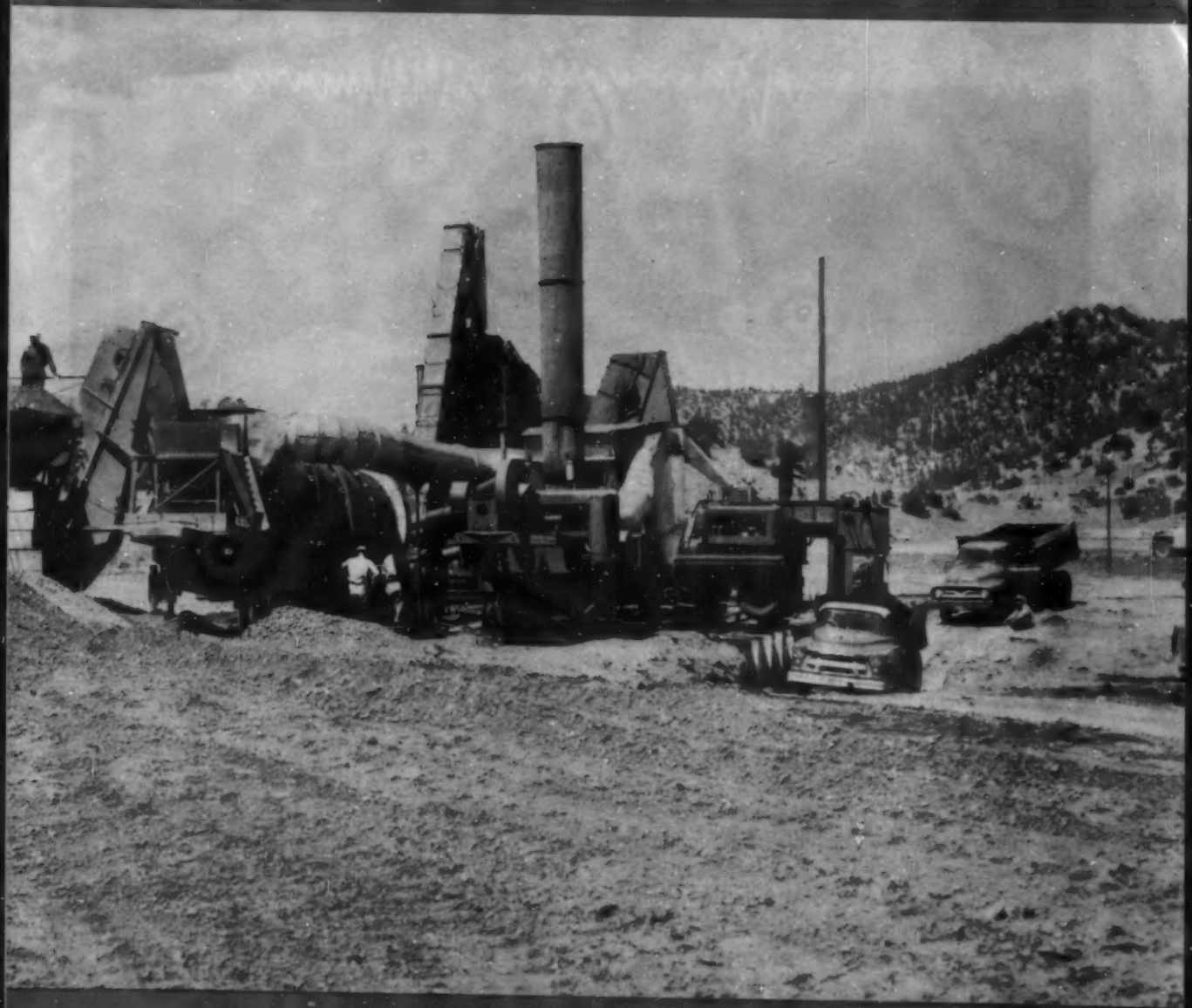
It was contended by the United States Secretary of Labor that these employees were subject to the wage and hour provisions of the Fair Labor Standards Act in that they were engaged "in interstate commerce or in the production of goods for interstate commerce" for workweeks longer than forty hours without time-and-a-half overtime compensation for such work in excess of forty hours.

In its decision the federal court said, "That these employees performed no actual manual labor on the projects under repair and improvement appears not to be of controlling consideration. We find no requirement in the Fair Labor Standards Act that they do so.

"The employees preparation of plans and specifications for the repair and improvement of existing instrumentalities of commerce together with the activities of the resident engineer at the actual job site were sufficient to bring them within the coverage of the 'in commerce' phrase of the Fair Labor Standards Act."

Mitchell v. Brown, 224 Fed. 2d 359, Iowa, July 12, 1955.

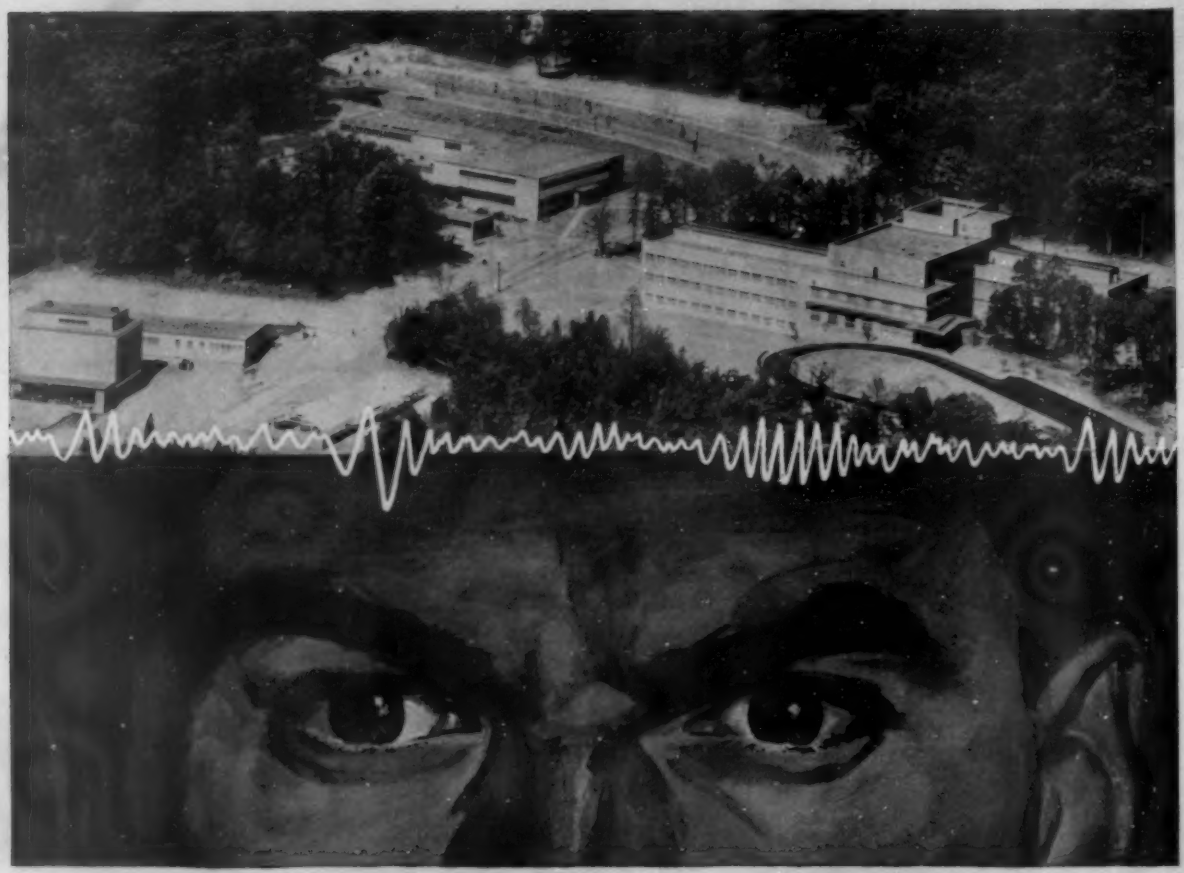
Bituminous ROADS AND STREETS



Hot-mix plant for U. S. 85 relocation, one of New Mexico's Interstate projects near Santa Fe. Barber-Greene units set up here by Metropolitan Paving Co., of Oklahoma City, include a Model 837 dryer and 827 dust collector, powered jointly by a single International diesel power plant; a No. 866 gradation unit, 848 mixer, and related equipment.

Published at Gillette Publishing Company
22 West Maple Street, Chicago 10, Illinois

OCTOBER, 1957



Here, creative minds will shape the future

Yes, here in the new Research Center of United States Rubber Company the probing minds of chemists and other scientists will find the ideal environment for conceiving new ideas...the finest facilities for bringing them into reality. Located on a 100-acre tract in suburban Wayne Township, New Jersey, the Center is a concrete symbol of the basic importance of Research in this company's past, present and future.

Significantly, at least 25 of U. S. Rubber's major product lines have been developed within the past twelve years.

As the Chemical Division of U. S. Rubber, Naugatuck Chemical continues to contribute a generous portion of new and improved products... such as Surfa-Sealz®, the specially-prepared rubber additive for lengthening service life of asphalt paving.

Such developments stem not only from our research laboratories at Naugatuck, but also from Naugatuck's agricultural research facilities at Bethany, Connecticut, and the laboratories of our Canadian affiliates, Naugatuck Chemicals and Dominion Rubber Company, Ltd. Now, Naugatuck's research will be substantially augmented—and perhaps channeled in radically new directions—by the more fundamental research carried on at the new Research Center.

In the future, even more than in the past, look for the name Naugatuck to identify *the newest and the finest* products in their respective fields!

United States Rubber

Naugatuck Chemical Division, NAUGATUCK, CONNECTICUT

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

BRANCHES: Akron • Boston • Gastonia, N. C. • Chicago • Los Angeles • Memphis • New York • Philadelphia • CANADA: Latex Div., Dominion Rubber Co., Ltd., Montreal • CABLE: Rubexport, N.Y.

... for more details circle 290 on enclosed return postal card

Asphalt Producers asked to

Give More Thought to Asphalt User Problems

A consultant who graduated from refinery engineering, and who today is rendering a specialized service to the highway engineer, contractor and other asphalt users, offers a timely suggestion to refiners. Asphalt plant owners especially will be interested in these excerpts from a paper on refiner-user coordination presented at the annual meeting of the Western Petroleum Refiners' Association held in March, 1957, at San Antonio.—Editors

By W. B. Warden

Miller-Warden Associates, Consultants, Swarthmore, Pennsylvania

Editors' note: It should be understood in reading these excerpts that the author is addressing a group of petroleum refiners having varied interests as asphalt producers. We have deleted the introductory remarks which cite some early experiences reflecting the need for improved coordination between the asphalt producer and user in certain industrial applications. Mr. Warden continues:

HOW MUCH more might be accomplished with asphalt if the user had a better understanding of the scope and limitations of asphalt technology from the producer's viewpoint; and if the producers in turn knew more about the users' problems.

This became a challenge to me as I could see the opportunity to build a career around bridging the gap between the producer and the user of asphalt. After purposely changing jobs to round out and obtain a broader background in the field, I established Miller-Warden Associates in 1948 for the purpose of rendering a consulting service to the asphalt industry.

The proof of the pudding lies in the fact that our business has been successful and has grown steadily for over eight years. Our very existence is a living demonstration that there is a need in the industry for better liaison between the producer and the user of asphalt. We have found that there are still eminent asphalt technologists on the user side of our industry who to this day do not know what the inside of a vacuum tower looks like; nor do they have a proper understanding of refinery economics and operating limitations. Unfortunately, the converse is also true, too many of our asphalt technologists from the refiners' viewpoint have insufficient knowledge of the users' terminology, problems, requirements and operating limitations.

The principal point garnered from experience on both sides of the fence, which I feel would be of most benefit to this group, is the realization that asphalt is used in large part with other materials and is judged as a finished product in combination with these other materials. There are very few places where asphalt is used alone. The bulk of the uses for asphalt involve its combination with felt, with fibres, with filler, with aggregate, and a multitude of other things. I would like to emphasize again that asphalt is judged, in large part, *not* on its own merits but on that combination of materials that makes up the finished product. The moral of this part of today's discussion is that you, as refiners, should pay more attention to these finished products by devoting more of your research dollars to the study of this combination of materials, instead of devoting all of your attention, time and effort to the asphalt alone.

This does not mean a cursory study, by any means. Management should be prepared to have their research and technical service people really live with this combination of materials, and with your customers who use asphalt in these various combinations. Asphalt is one of the few petroleum products that is not burned up or worn out in a few seconds or weeks, but stays around for years and years to be pointed to with pride (or the reverse) by those responsible for its quality and proper use. It represents some 20 percent or more of your crude barrel and is a good basic raw material that serves mankind well. You can upgrade its price, broaden its scope, and help it do a better job by paying more attention to its combination with the other materials with which asphalt is used. Remember, asphalt is largely judged by and attains its competitive position by being combined in a finished product.

Now, you might well say, "Okay, there may be a worthwhile point here with respect to *industrial* applications; but how about paving? —we're interested in selling lots of paving asphalt for this new federal highway program—and here we are bidding against standard state specifications!" Gentlemen, the need is even greater in the case of paving applications than it is for the industrial applications. Of all the combinations of materials wherein asphalt is blamed first, paving is probably the most outstanding example. Whenever something goes wrong with an asphalt pavement, the public as well as your customers, the contractor or the state agency, tend to blame the asphalt—even though asphalt constitutes only approximately five percent of the average bituminous concrete.

Why should this be true? Well, for one thing, the contractor and the state highway engineer can see and feel a stone. There is something he has been familiar with from boyhood—he's kicked it, and thrown it, and he feels that he knows something about the aggregate which constitutes the bulk of the pavement. But, what does he know about asphalt? Most of what he knows is what your salesmen tell him.

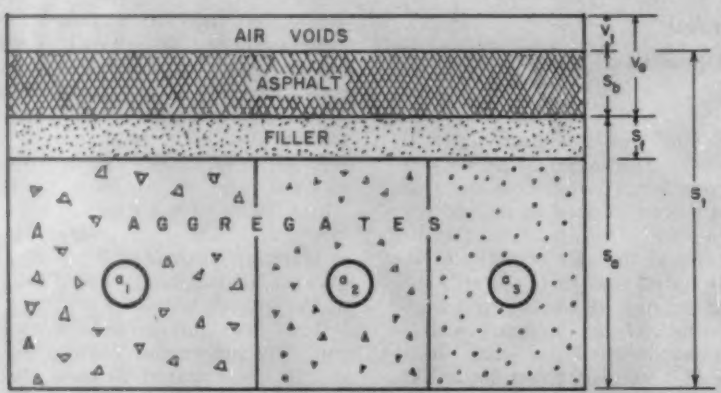
Selling Asphalt

Let us be realistic about how asphalt is sold. It is sold primarily on price, with a little bit of personal friendship and a little bit of service from a delivery viewpoint. Your salesmen soon run out of talking space on these points. So it's perfectly natural and understandable for them to then talk about how much better their asphalt is than their competitors' because of inherent molecular stability, or Oliensis spot test, or ductility, or viscosity temperature susceptibility —terms the contractor doesn't understand in the first place; and in the second place, he doesn't care!

Further, I am afraid that some of our salesmen like to show off their knowledge of refinery terminology by using such terms as residual stocks, vacuum tower bottoms and so forth, thus giving the customer the impression that asphalt is a by-product, something that is left over. Sure, the contractor is confused. No wonder he blames asphalt first. When something goes wrong in his plant that he doesn't understand, it must be what that salesman was talking about; yes, it must be the asphalt!

Your customer in the paving field is not interested in inherent molecular stability, or viscosity temperature susceptibility. He is interested in raveling and rutting and shoving, and in keeping that kid inspector off his neck. It is here that you can render a real service to the industry, as well as to create good will and build on a solid technical service basis with your customer.

Before going further along these lines, let us review just what bituminous concrete is and how it is made. Figures 11 and 12 are taken from Miller-Warden Technical Paper No. 53, "Hot Mix Concrete Bituminous Design by the Marshall Method," which was presented before the National Bituminous Concrete Association in February, 1957.*



FORMULAS FOR WEIGHT AND VOLUME RELATIONS

	SPECIFIC GRAVITY	UNIT WEIGHT LBS PER CU FT	PERCENT SOLIDS BY VOLUME	PERCENT VOIDS BY VOLUME
Total Mix	G_m	$U_t = 62.4\, G_m$	$S_t = 100\,\frac{G_m}{G_t}$	$V_t = 100 - S_t = 100\,\frac{G_t - G_m}{G_t}$
Aggregate Only	-	$U_s = U_t \times \frac{100 - W_b}{100}$	$S_s = S_t - S_b$	$V_s = 100 - S_s = V_t + S_b$
Asphalt Cement	G_b	-	$S_b = \frac{G_m W_b}{G_b}$	-
Filled with Asphalt	-	-	-	$V_f = 100\,\frac{S_b}{V_s} = 100\,\frac{S_b}{S_b + V_t}$

Theoretical Max. $G_t = \frac{100}{S_t} = \frac{100}{S_s + S_b} = \frac{100}{\frac{W_1}{G_1} + \frac{W_2}{G_2} + \frac{W_3}{G_3} + \frac{W_f}{G_f} + \frac{W_b}{G_b}}$

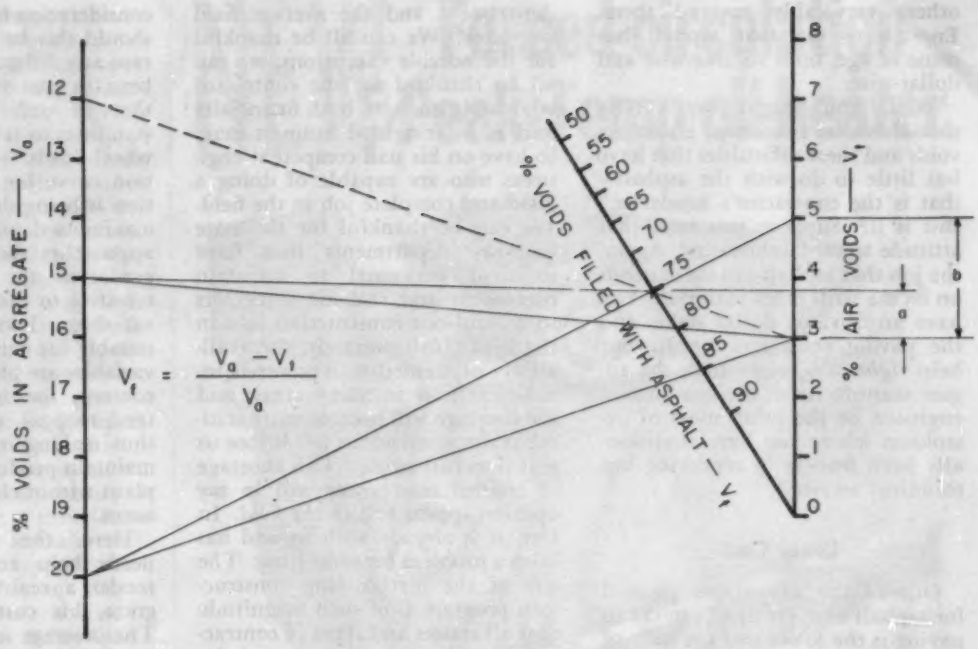
F/B ratio $= \frac{S_f}{S_b} = \frac{W_f G_b}{W_b G_f}$

• Figure 11. Diagram showing volume relations in asphalt paving mixtures, and formulas for weight and volume relations. (Miller-Warden Associates)

What Is Bituminous

Figure 11 shows the combination of materials which make up bituminous concrete. It consists of various sizes of aggregate or stone varying from about one inch maximum through a relatively fine sand. The other ingredients are a filler (minus 200 mesh material, usually limestone or trap rock dust), the asphalt, and the air voids which are entrapped in the mixture. The coarse aggregates are proportioned from bins on the cold feed, fed together through a rotary kiln or dryer up the hot elevator to the screens. Here the dried (partially dried?) aggregate is normally separated into three hot bins. From here the aggregate is either weighed or volumetrically proportioned into a twin shaft pug mill. The filler is added and the dry ingredients mixed for approximately 15 seconds. Then the asphalt is added and the mix wet-mixed for an additional 30 to 60 seconds. The mix is then dropped into a truck, trans-

* See "Plant Owners Need More 'Savvy' on Hot Mix Design and Control," Roads and Streets, April, 1957, p. 210.



• **Figure 12. Relationship of air voids—voids in aggregate and percent voids filled with asphalt in all bituminous mixes. (Miller-Warden Associates)**

ported to the road bed and spread and compacted.

This is all bituminous concrete consists of—a mixture of these simple ingredients; and the technology seems (on paper) to be fairly easy. Let us look, however, at just one of the ways in which the contractor, your customer, can get into serious trouble. Figure 12 is a nomograph which shows the relationship existing among the air voids in bituminous concrete. The right-hand ordinate shows the air voids remaining in the finished road. Usual specifications allow a tolerance of three to five percent. If the air voids are less than three percent, there is danger of bleeding of the asphalt to the surface, resulting in a slippery pavement, because there is insufficient room for differential expansion in the summer-time. If the air voids exceed five percent, there is danger of loss of durability due to freeze-thaw action.

The left-hand ordinate shows the air voids in the aggregate and filler combination itself, with no asphalt. The slanted line shows the percentage of air voids in the aggregate which is filled with asphalt; and the usual specification for voids filled in airport work is 75 to 85 percent. The solid lines show the extrapolation of the specification limits; and it can be seen that the contractor has his full tolerance for air voids in the compacted finished pavement, and the percent of voids filled, if the starting voids in the aggregate and filler combination is 20 percent.

If, on the other hand, the contractor is using an aggregate gradation closer to the maximum density curve, and the voids in the mineral portion are only 15 percent (a rather common occurrence), then it will be seen that he has mathematically reduced his operating tolerance by more than half on the air voids remaining in the finished pavement and by exactly half in the percentage of voids filled. Then he is eternally in trouble with his inspector, his plant is frequently shut down because he is operating outside of the specifications limits on one point or the other; and his costs may therefore be greatly increased.

Proper Inspection

This is just one of the ways in which a contractor can get into serious difficulties; and it will be noted that this trouble has absolutely nothing to do with the quality or nature of the asphalt. The same mathematical relationships exist regardless of the grade or type of binder. In fact, he would be in the same trouble if he were using molasses or something other than asphalt. Obviously, without proper inspection or quality control, the contractor might try to get out of this difficulty by operating outside of the specification limits; and in any case, the restricted tolerances will force him to work close to one of the limits so that, just by the law of averages, some of his production will probably not be up to standard. Thus he runs a greater danger of either having a slippery pavement or one that may deteriorate rapidly. In either case, the industry is hurt and you as producers of asphalt are hurt.

In addition to showing just one of the ways in which a contractor can get into trouble independently of the asphalt, I have another motive in presenting Figure 12. Honestly, now, how many of you (refinery men) were familiar with the voids relationships existing in a bituminous concrete pavement? I would wager that a majority of this group have but little previous knowledge of these factors and are not familiar with these basic considerations. Still, here is a customer that used some 90,000,000 bbl. of one of your products in 1956, and this on a rising market slated to go to some 135,000,000 bbl. in the next few years.

Further, this customer paid for that product about the same price barrel for barrel that you received for your gasoline. When one considers the relative capital investment required to produce a gallon of gasoline versus a gallon of asphalt, this realization takes on greater significance. How often does the refinery Profit and Loss Statement swing on your return for the heavy ends of the crude barrel? I will not dwell on these factors, as

others very ably covered them. Enough to say that asphalt has come of age, both volume-wise and dollar-wise.

Well, you might say, "Why should we be concerned about air voids and these difficulties that have but little to do with the asphalt—that is the contractor's headache." But is it? Suppose you took that attitude toward lubricants! Again, the job that asphalt can do depends on its use with other materials. You have an obvious dollar stake, and the paving contractor needs your help *right now*, more than the engine manufacturer, the combustion engineer, or the other users of petroleum where you have traditionally been leaders in rendering top technical service.

Lower Cost

One of the advantages claimed for asphalt over portland cement in paving is the lower cost per mile of the bituminous construction. This cost differential may be as high as 40 to 50 percent. Obviously, anything that causes the contractor trouble in the field increases his average cost and decreases the competitive gap between bituminous and portland cement construction. Not only does lower cost improve your competitive position, but the lower the cost per mile, the more and better roads can be built—on which more cars and trucks can travel more miles, consuming more gasoline and oil. As Dr. J. E. Buchanan has so aptly stated, "These new roads must be provided at a price the road-user can afford to pay, or the law of diminishing returns is set in motion by the steadily advancing gasoline taxes. Asphalt, a petroleum product, offers the best hope of getting these roads with reduced pressure for additional gasoline taxes. Hence it is in the enlightening self-interest of the oil industry to promote its own product for new road building."

Thus far, my remarks have been of a somewhat general nature. Just what, specifically, can you do as individual refiners or collectively as W.P.R.A. members? In my opinion, the answer lies in rendering proper technical service *in the field* to your individual customers. I have a few specific suggestions.

Before going further, however, I would like to make it very clear that in making these suggestions, I am speaking of the average contractor, the average state highway department and the average field inspector. We can all be thankful for the notable exceptions; we can all be thankful for the contractor who is big enough, both financially and as a far-sighted business man, to have on his staff competent engineers who are capable of doing a good and complete job in the field. We can be thankful for the state highway departments that have sufficient personnel to maintain competent and realistic inspectors to control our construction jobs in the field. Unfortunately, the availability of trained man-power is insufficient now in many areas; and the shortage will become more critical as the tremendous job before us gets into full swing. This shortage of trained man-power will in my opinion appear first *in the field*. In fact, it is already with us and has been a problem for some time. The size of the forthcoming construction program is of such magnitude that all classes and types of contractors, suppliers, engineers, and inspectors, will be called upon to do the job. It is to this average group that the following suggestions primarily apply.

First, it should be realized that this is a huge industry. It is not only one of our biggest dollar-wise, but it is all-encompassing from a geographic viewpoint. Raw materials and methods will vary widely from area to area. There is a need for well coordinated planning and study among the district engineers of our state highway departments, the suppliers and the contractors, to arrive at the optimum utilization *of local materials* and their proper combination to yield high quality roads at a reasonably low cost. Thus, one of the first things your people can and should do is to work with your own customers and your own district and county engineers, in your own back yard, to provide the optimum combination of materials for that particular locale. Such effort should be closely coordinated with a local representative of the Asphalt Institute.

The second specific suggestion has to do with quality control. Higher wheel loads and higher traffic count are imposing an increased service requirement on our pavements. *The quality difference between bituminous concrete and portland cement concrete is becoming more and more a function of how well asphalt construction is controlled in the field.* The foregoing statement is emphasized because it is an extremely important consideration for our industry. Why should this be so? Why is the picture any different today than it has been in past years? The reason is that in order to obtain higher stabilities to take care of the higher wheel loads, the aggregate gradation curve for high type construction is being designed closer to the maximum density gradation. As one approaches the maximum density gradation, the mix becomes more sensitive to the effects of operating variables. Instead of having reasonably flat curves when dependent variables are plotted against asphalt content, for instance, the curves tend to peak much more rapidly, thus making it more important to maintain production at the hot mix plant within closer operating tolerances.

Here, the average contractor needs help and the refiner can render a real service to the program, his customer and himself. The average contractor, unfortunately, has a poor understanding of such elementary things as proper sampling procedure, testing techniques, utilization of field laboratory control methods and so forth. Your salesmen and field representatives can help him and the local inspector with these quality control problems.

Another Advantage

Another point where help is frequently needed in the field involves correct operation of the finishing machine. Another of the advantages of asphalt paving over portland cement concrete is the smooth ride, free of joint and crack "bumps." The public appreciates and looks forward to this smooth ride. On the other hand, *if* a finishing machine is improperly handled or is out of adjustment, the smooth ride is jeopardized and this advantage may be lost. While the equipment manufacturers will and do train an operator for the contractor when he purchases a machine, too often we find that the field equipment is being operated by people who are improperly trained or who do not know how and when to make necessary adjustments. Again, your field engineers could in a short time learn how to best help the contractor keep his equipment in prime working condition and assist in training their new operators. Again, your average customer in this business needs help; and the industry and you as refiners, need to maintain the competitive advantage

of the smooth bituminous ride.

At a somewhat different level, the matter of specifications warrants consideration by the refiners and the industry. Work is already progressing toward simplification of specifications, and this is highly desirable. There is another aspect, however, which is not generally recognized, and I will cite just one example wherein the normal specification for the use of your product actually inhibits obtaining optimum quality. As we all know, asphalt in thin films tends to harden, and this is a time-temperature reaction. Most specifications place a maximum on the mixing temperature, usually 325 deg. F., in the hot mix plant, and in some cases, the optimum mixing temperature is quite logically made a function of the viscosity of the asphalt. Still, most of these same specifications completely ignore the time side of this time-temperature reaction, by imposing a minimum rather than a maximum mixing time. It is readily admitted that the aggregate, filler and asphalt should be properly and uniformly mixed. But these arbitrary specifications completely remove the incentive for the equipment manufacturer or the contractor to improve his mixing efficiency and thereby decrease mixing time. Longer than necessary mixing time means lost production, higher power costs and a quality degradation of the asphalt.

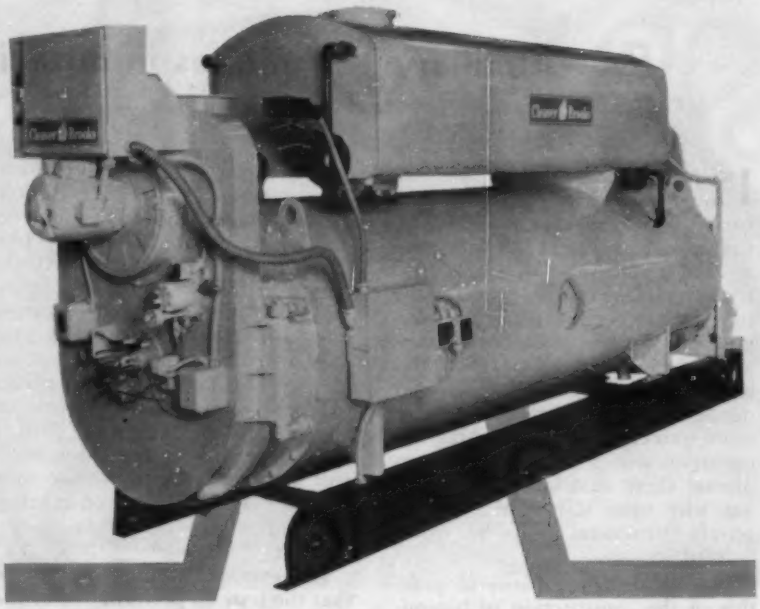
Realization of some of these factors and cooperative work with the Asphalt Institute, equipment manufacturers and our state highway engineers could be fruitful. There are other points where a proper understanding of what it takes to build a road and how a road is built will help the industry and yourselves.

Asphalt Additives

My final point has to do with additives in asphalt and here I am speaking of the full gamut of additives—rubber-in-asphalt, anti-stripping agents, ductility improvers, loss-on-heat improvers, weathering (actinic ray) inhibitors and so forth. Some in our industry have expressed the viewpoint that asphalt is a good product because nature made it that way and it doesn't need to be improved with additives. Again, suppose you took that viewpoint toward lubricants and lubricating oil additives? Let's approach the question of additives in the

(Continued on page 150)

NEW Forced circulation Peak-Temp oil heater



Speeds heating of asphalt

Forced circulation of heat transfer oils assures uniform heat distribution . . . improved heat transfer, without "hot spots" or coking. Built-in impeller circulates heat transfer oil at 8 ft. per second, maintains constant oil flow across the furnace and tubes.

Other design advantages:

- **Heat transfer oil lasts indefinitely because hot oil is in minimum contact with air.**
- **No pressure or water problems. Operates at atmospheric pressure; heats and circulates efficient heat transfer oils at temperatures up to 450° F.**
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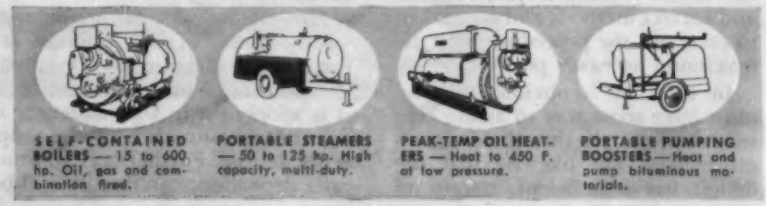

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VIEWS AND COMMENTS

. . . By H. G. Nevitt

Auxiliary Techniques in Bituminous Design

In the preceding issue we outlined, in very simple fashion, the basic requirements for sound bituminous pavement design. We showed that essentially structural tests were required to evaluate the functional effectiveness of the proposed mix, and that all other tests would be justified only if they could be correlated to these functional needs, or would aid the designer in more quickly or easily reaching the optimum design. We now wish to discuss these auxiliary tests, showing why some data which is not purely structural may be quite helpful.

In turning from theory to practice in the construction of bituminous pavements, we are at once confronted with two very definite realities; these must not be lost sight of at any time.

The first is the fact that the design pavement is rarely actually duplicated in the field construction. Despite accurate sampling and care to use representative materials, those actually going through the mixing plant will inevitably vary slightly from hour to hour from the materials used in the design. Consequently the design must have sufficient tolerance to allow for these unpreventable variations in the materials and likewise in the controls of the plant.

Testing Techniques

Secondly, we must recognize that our testing techniques are far from accurate. Here again we must be certain that we have a sufficient margin in the design adopted to allow for the fact that the test procedure may not exactly duplicate the actual results, despite rational and correct methods and care taken to carry out the procedure with the maximum accuracy possible.

In brief, it is obvious that we must have some way to assure ourselves not merely that the design is satisfactory, but likewise that the design has a sufficient margin of safety to carry out its functional requirements despite the variations or errors noted above. This is more easily done through corollary tests than by attempting to modify the design within the range that might be anticipated, and then repeating the entire testing procedure with purely structural tests. In brief, we may use these other test procedures to increase our ability to obtain an ideal design (or shorten the path to it) and lessen the labor involved; and we may furthermore use such tests to evaluate the factor of safety inherent in the design finally arrived at.

However, care must be taken that the tests do perform one or the other of these functions. We doubt if this is the case with many tests utilized by some engineers or in some of the standard techniques. Such tests may have an empirical basis, in that all successful designs so far made by this approach happen to fall within specified requirements. But this is far from giving us assurance that the test has meaning or is necessary. In fact we suspect that some arbitrary demands based on tests of this type cause rather than prevent trouble.

What are the helpful tests? In our own personal view, the one which will lead most quickly to a desirable design is the test for voids in the mineral aggregate—that is, the space in the pavement not occupied by either asphalt or air. The experienced designer provided with such information (gained through some preliminary testing) can quickly estimate the steps required to get a mix which will either meet the final requirements or can be easily modified to obtain the optimum.

However, others prefer tests which in the writer's opinion are not quite so meaningful. Density is the favorite of such alternate tests; it is widely used. Unfortunately it does not measure directly the properties desired. Furthermore in some cases dependence on density will be misleading; many errors in pavement design can be attributed to undue concentration on density data without regard for the other factors, particularly the structural tests which should be the true and final basis of the design.

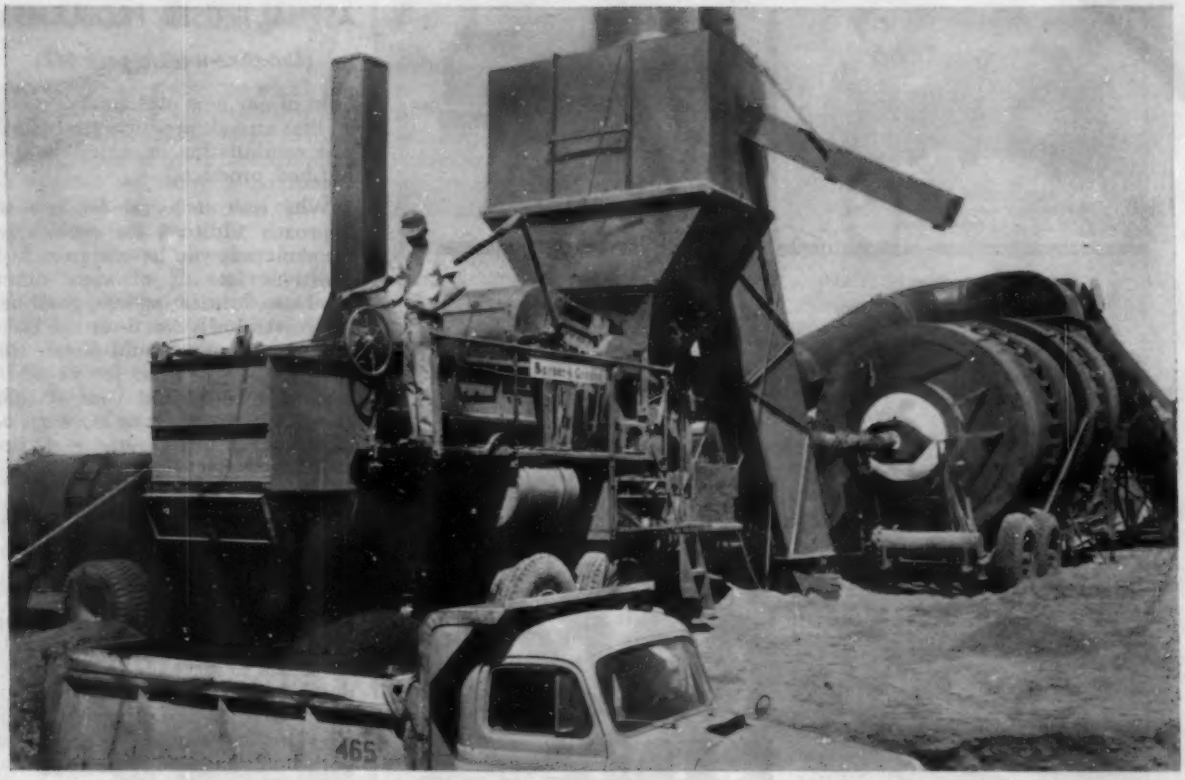
Some designers have views quite contrary to these. They proceed almost entirely by density to the final design, or at least to a tentative design which is then checked by structural and other methods before acceptance. This school works on the assumption that maximum strength will result from maximum density provided the voids do not become overfilled. Unfortunately this is not necessarily true, although it very often holds. With some aggregrates the maximum density is not that which produces the best structure. Space does not permit a detailed discussion of this point, but one reason for this situation can be briefly indicated. A maximum density structure in which smooth particles of finer aggregate replace the direct contact of other more frictional materials might very well be a less desirable mix.

Safety in Mixes

A very valuable test is one which indicates the factor of safety in the mix. In our view this is a field in which there has been the least thinking, with utilization of tests which really have little significance. A brief analysis of the situation may confirm this impression.

Generally speaking a desirable mix is one which has a low void content, with corresponding low access to moisture and air or other oxygen bearing materials. A critical mix is one in which the void content is so low as to provide no margin of safety. That is to say, the mix will be a dangerous one when flow of the binder during compaction, binder volume increases due to temperature, or other adjustments are not possible because there

(Continued on page 151)



48 hours after this picture was taken, this asphalt plant was operating 70 miles away

In its first season of operation, this Barber-Greene Model 848 continuous plant was moved to six different job sites . . . produced 111,315 tons of quality hot mix in 555 hours of operation for an average of 200 tons per hour.

All plant components are mounted on rubber-tired chassis for over-the-road towing at truck speeds.

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Typical of the many Barber-Greene plant owners, this Minnesota contractor operated with the basic equipment first and later purchased the Gradation Control Unit. He can meet any specification, and has the flexibility of towing the Gradation Unit only to those jobs requiring screening after drying.

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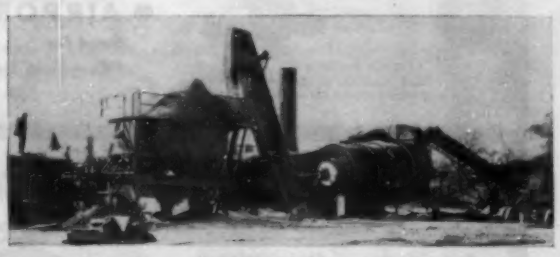
Plant operation is based on the Barber-Greene continuous principle which is inherently automatic. Once the controls are set, the plant produces at top efficiency and accuracy.

Barber-Greene manufactures a complete line of continuous and batch asphalt mixing plants with capacity ranges to meet your production requirements.



Same continuous plant with Gradation Control Unit added.

Write for literature on any continuous or batch plant in Barber-Greene's complete line. 56-2-A

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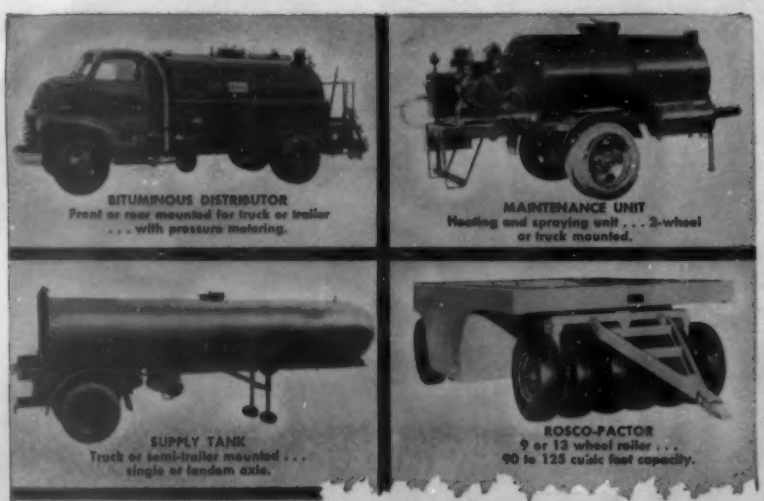
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ASPHALT USER PROBLEMS

(Continued from page 147)

light of our new philosophy, namely, that asphalt products are judged as a combination of materials in a finished product.

Why isn't it logcal for you to approach additives for asphalt in the same way you have approached additives for all of your other products—lubricating oils, gasoline, fuels, even lowly No. 6—on the basis that the end use should dictate the need or lack of need for an additive, and study and control that need or lack of need on the basis of the requirements for the end use?

Admittedly, there has been some promotional effort on the part of the additive manufacturers, which is not to our liking. Attempts have been made by some to oversell additives. But this should not detract from the desirability of using the proper additive in proper amounts as needed to meet the requirements of the finished product. I fully anticipate that the use of various additives in the asphalt industry for both industrial and paving applicatons will increase. The science is still in its infancy, but it's gaining strength very rapidly. Where do you as refiners want the control of this whole additive question to lie? Totally with outsiders and proprietary interests? Wouldn't it be smarter to be open-minded and cooperative—keeping your finger in the pie?

Progress Being Made

In conclusion, I would like to cite the work being done by others in this field. The Asphalt Institute in particular is doing a very fine job and we are pleased to note from our friends in the Institute that the bulk of their effort is directed toward the combination of asphalt with other materials rather than on the asphalt itself. Much fine technical information is coming out of the Asphalt Institute laboratories at College Park, as well as from such organizations as the Highway Research Board, the Association of Asphalt Paving Technologists, American Association of State Highway Officials, Corps of Engineers, and others. I'm afraid, however, that much of this valuable information is not being used as effectively as it might be because of poor communications.

(Continued on page 152)

AUXILIARY TECHNIQUES

(Continued from page 148)

are not enough voids into which the excess material can move when this occurs. A mineral aggregate to mineral aggregate contact through films of normal thickness is no longer maintained, with the result that the mix lacks stability.

The criterion of safety here is that there be sufficient voids into which this excess material can flow, whatever the cause of the need for this flow. Obviously it does not matter what air spaces are present in the mix, but only whether they are accessible to excess material; whether the voids are in the aggregate or between the aggregate; or similar. The only important factor is that there be voids which are accessible to flow. Logically it would then appear that the only void content which has significance is that which can be determined by a flow mechanism, such as air under pressure or vacuum. All methods by which voids are calculated—that is, methods depending upon densities; methods depending upon estimating absorption of the asphalt; and all other such approaches—have dubious value because, whether or not they correctly measure the content of the voids, they do not provide any information as to whether these voids are susceptible to being filled by the binder through flow.

The elementary and simple views expressed in this and the previous article may surprise some readers. However are they not essentially correct? Do not more elaborate or complicated mechanisms or procedures in the design of asphalt pavement mixes require proof that they are necessary? Has not perhaps the design of asphaltic mixes overreached itself, in that in the effort to empirically correlate test techniques and mix properties, measurements have crept in which have no significance and do not belong in the picture?

Flow Procedure

Let us sum the situation up briefly. A mix functions as a structure; consequently direct evaluation of mix properties requires only structural measurements. The only need is to make sure that these structural measurements are taken for each condition of the mix that may prove critical. However, some knowledge of the mix volumetric properties may be helpful in formulating the best aggregate combination; and a measurement of the actual interconnected voids—hence voids which can be measured by some flow procedure—is desirable to make certain that the mix has a sufficient factor of safety to avoid overfilling under expansion or other conditions. There is always a possibility that other tests may be justified as throwing more light on the mix characteristics; but unless such can be really proved, they would seem to be merely superfluous.

Basic Need

It would then appear that (as is usually the case) the design principles behind the proper selection of an asphaltic mix are simple. This does not mean that the task of preparing and testing samples which properly duplicate pavement conditions in every respect is an easy one. As a matter of fact these procedures offer many difficulties. Nevertheless, at the present time they seem to constitute the only rational approach to proper design.

Certainly the use of numerous empirical tests, many of which have no real relationship to the needs of the design and give negligible help in designing the mix, is unnecessary and is perhaps adding to the burden without compensating benefits. We clearly require better bituminous design; it should not be hard to obtain it, once we recognize that a rational approach, with all that it implies, is the basic need.

New Chip Spreader Assures Better Surface Treatments

By Fred Swineford

Highway Engineer, Columbus, Ohio

The new power driven stone chip spreader now keeps up with the bituminous distributor, applying cover with the accuracy and speed of the distributor. The larger particles are deposited first on the hot bitumen, insuring adhesion. The smaller particles follow to fill the interstices, with the result that there is less than 2 per cent kick off and no bleeding.

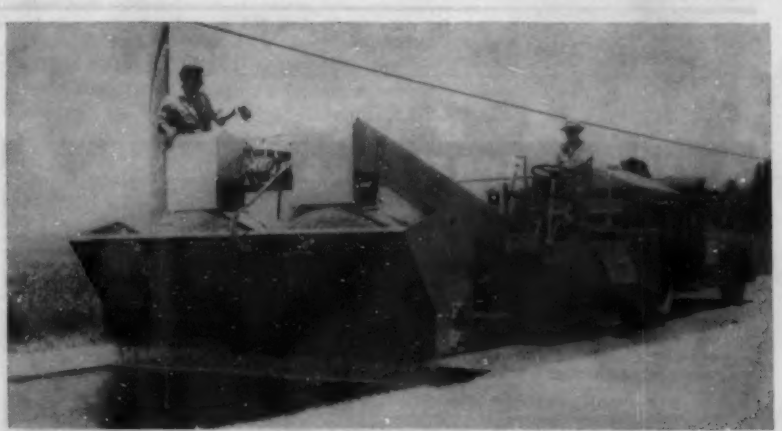
As an example of the latest mechanical developments, this 8 ton power driven spreader, pictured here, tows the stone truck. It has capacity to continue spreading from the time the empty truck is uncoupled until the next loaded truck is coupled on. An automatic coupler releases and couples stone trucks as the spreader continues at uniform speed.

Bituminous surface treatments have been used for many years to preserve and improve all types of pavements, and will continue to be used in the future. They are usually applied to existing bituminous surfaces but they are also used to seal traffic bound roads and to deslick concrete pavements.

With modern day traffic, cars must not drive on new sticky surface treatments and traffic interference must be reduced to a minimum. These things can be accomplished by confining the surface treating operation to a short length of road by using modern methods and equipment like improved bituminous distributors and chip spreaders which will keep up with the distributor and apply the cover on the hot bituminous material.

Mass production (1800 tons per day) chip spreaders, apply the cover on the hot bitumen, reduce kick off and confine the work to a short distance.

● Speed limits set for the Sunshine State Parkway toll road in Florida; 65 mph day and night for all vehicles.



• **Power spreader pulls the truck, follows closely behind the distributor. (Photo courtesy Flaherty Mfg. Co.)**

ASPHALT USER PROBLEMS

(Continued from page 150)

The Asphalt Institute and others would like to have the contractors read and understand their publications but, unfortunately, the average contractor is limited on how much can be absorbed and properly adapted to field use.

What better place for your salesmen and technical service engineers to render a service to yourself, the industry, and particularly to your customers, than to have them study these publications as they are issued and interpret the pertinent findings as they apply to your own customers in your own back yards!

Asphalt Containing Neoprene Being Tested in Five States

Highway engineers in five states are cooperating with Du Pont rubber chemists in road testing strips of asphalt containing neoprene synthetic rubber. If these field tests substantiate seven years of laboratory investigations, neoprene may add substantially to the life of the road surface and at the same time add safety and cut maintenance costs.

The synthetic rubber is mixed in specific proportions with standard asphalt and the surface material is applied with conventional equipment. The test material is laid side-by-side with usual asphalt so that both surfaces will be exposed to identical treatment. In this way, regular inspections of the strips will give accurate comparisons.

It is expected that neoprene will add elasticity to the asphalt, thereby holding the stone chips in place longer. In addition to longer life, this will offer better traction, thereby adding an important safety factor. In approaching the various state highway departments, Du Pont requested "typical rural roads" for test sites.

Recently, a 5.26 mile strip was laid in Lancaster County, Pa., that will give an added test. This section of Pennsylvania is in the heart of the Amish community and in addition to automobile traffic, there is heavy travel by horse and buggy.

Photographs are taken when the surface is applied and the highway engineer-rubber chemist team will inspect the condition of the strips at regular intervals and during unusual climatic conditions. At spots where unusual wear is expected, special patches are marked and a series of close-up photographs will record how the material stands up. Usually these spots are selected on sharp curves, at the crown of rises, or in the center of dips in the road.

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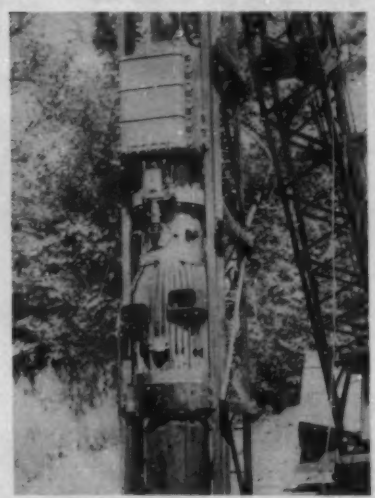
New Products

New Diesel Pile Hammer Has 3 Phase Power Cycle

The trend to diesel powered pile hammers has been accelerated by the introduction of a diesel pile hammer of "unique design" by Link-Belt Speeder Corp.

The Link-Belt Speeder diesel pile hammer is easily transportable, is completely self-contained, needs no auxiliary equipment and is one-man controlled. It eliminates the need for compressors, boilers, high-pressure hose, fresh water supply and other auxiliary equipment.

The use of the new one-man hammer can transform any power crane economically into a pile driver. A



● Link-Belt Speeder diesel pile hammer.

single cable to hoist the hammer into the leads in which it operates, is all that is necessary to position and to start it.

The diesel pile hammer line, now being made in the company's expanded Cedar Rapids plant, was acquired from Syntron Co., another Link-Belt subsidiary. The new hammer is a self-contained, free-piston, compression ignition machine operating on the two-cycle principle. Energy is delivered to the pile head, through the anvil, in three stages—pre-load, impact and explosive force. The hammer incorporates a closed cylinder top which traps and compresses air to form an "air spring." This limits upward travel of the ram, accelerates the ram downward and enables the hammer to obtain more blows per minute.

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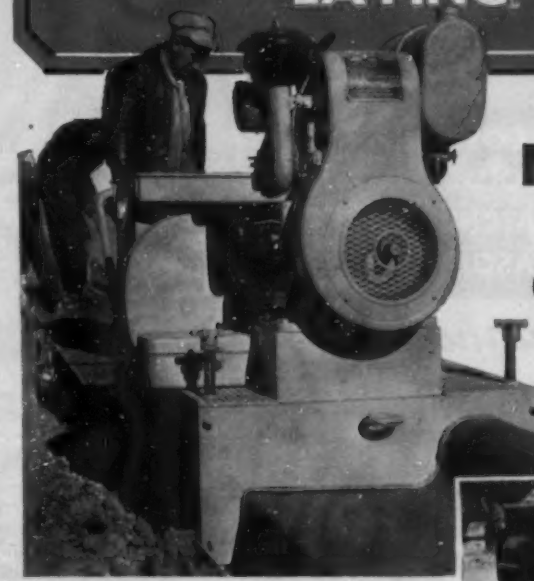

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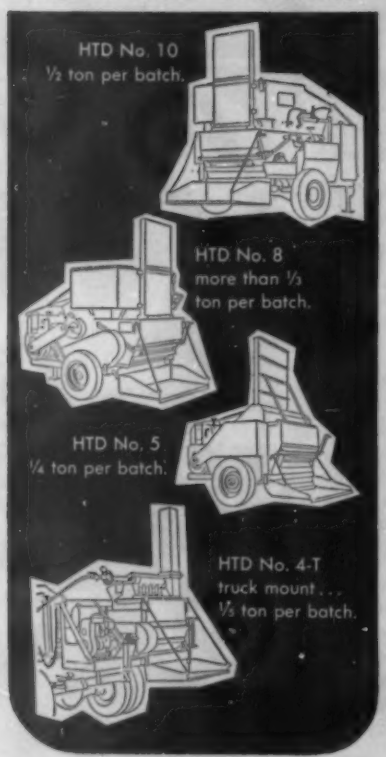

For details and specifications write . . .

McCONNAUGHAY MIXERS, INC.
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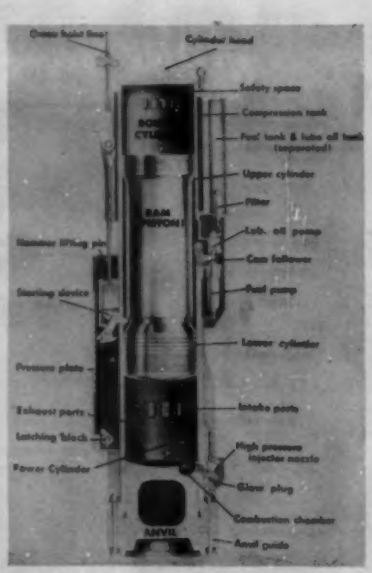

● **Cut-away drawing of new Link-Belt Speeder diesel pile hammer shows the major components and the unique closed "bounce cylinder" which acts as an air spring.**

load on the piling. Keeping the pile in more constant motion prevents it from "setting up" and minimizes the brooming, spalling or buckling tendency common with hammers utilizing a series of sharp, individual impacts to drive a pile.

The new line includes three models which can be used on any make of power crane. Model 105 delivers up to 7,500 ft.-lb. per blow and strikes 90 to 98 blows per minute. Another (Model 312) delivers up to 18,000 ft-lb. per blow, 100 to 105 per minute. The largest (Model 520) exerts up to 30,000 ft.-lb. per blow, 80 to 84 times per minute. The three range in length from 10½" to 13½ ft. and weigh from 3,600 to 12,500 lb. The hammers range from $8,250 to $16,500. Details are available in new catalog No. 2582 which may be obtained from Link-Belt Speeder Corp., Cedar Rapids, Iowa, or the company's distributors.

For more details circle 135 on enclosed return postal card.

Steel Culvert Form Permits Monolithic Culvert Pour

A new steel form, claimed to simplify the construction of culverts, has been introduced by Symons Clamp & Mfg. Co., 4249 W. Diversey Ave., Chicago 39, Ill.

The culvert form is designed to connect Symons standard wall panels and slab panels so that a culvert can be poured monolithically. No built-up forms or other special equipment is necessary, since all units are prefabricated and factory engineered.

Symons' culvert form is a 9 x 9-in. steel section which provides for a 3-in. face on the roof slab and on the wall

(Continued on page 168)

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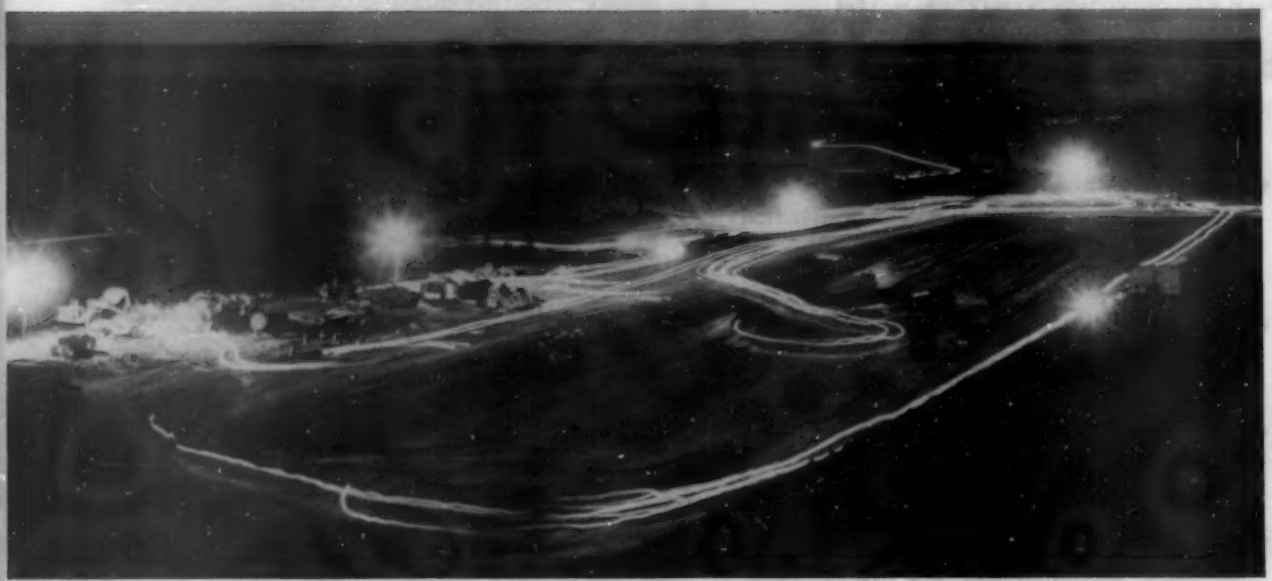
United States Motors Corporation
United States Rubber Company
United States Steel
United Steel Fabricators, Inc.
Viber Company
Waukesha Motor Company
White Instrument Company, David
Wickwire Spencer Steel Division
Wico Electric Company
Williams Form Engineering Corporation

Three reasons why

Contractors on Air Force Academy Project use STANDARD fuels and lubricating oils

Lubrication specifications are reviewed by A. R. Gaunt (left), general superintendent of Long Construction, and Standard Oil man, Ralph Dunn. Helping contractors with lubrication is a job for which Ralph Dunn is well suited. He has been doing such work for 12 years. Ralph is a graduate of Colorado State College and Standard's Sales Engineering School.



Night shift. $715,000 worth of Paul Hooper, Inc., equipment moved 4.5 million cubic yards of dirt at the rate of 25,000 cubic yards every day. Leveling site for building area included fills of up to 100 feet.

Here are three reasons why prime and sub-contractors on the $128 million Air Force Academy project, near Colorado Springs, use STANDARD gasolines and diesel fuels; STANOLUBE S-1 Motor Oil and other lubricants. (1) To serve contractors, Standard Oil maintains storage facilities for 82,000 gallons of petroleum products at the construction site. Standard men deliver to contractor's facilities directly from this installation. There's no time lost waiting for deliveries on this job. (2) Technical service on fuel and lubricants is provided contractors by experienced, qualified Standard Oil men. (3) When they buy from Standard, contractors know they are getting top quality products.

Men and machines moved seven million yards of dirt on this 17-square-mile site during 1956. Grading, utilities, arterial roads, sewer lines, water mains, portable water reservoirs and utility buildings are well on the way to completion. This is the sort of big construction that requires the "big" service Standard Oil gives contractor customers. Maybe you would like service such as this on your job. You can get it anywhere in the 15 Midwest and Rocky Mountain states. Call your nearest Standard Office, or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Paul Hooper Construction, Inc., has experienced no mechanical failures on job due to lubrication. J. L. Phillips, general superintendent, talks over lubrication with Standard's Ralph Dunn.

. . . for more details circle 299 on enclosed return postal card

STANDARD

STANDARD OIL COMPANY
(Indiana)

ENGINEERS — FOREMEN — OFFICE MEN
Learn latest methods to organize and run work. Prepare for the top jobs. Send post card for details.

GEO. E. DEATHERAGE & SON
CONSTRUCTION CONSULTANTS
P.O. Box 921 Lake Worth, Florida

DISTRIBUTORS WANTED
Amazing new general, all-purpose, 1-ton roller. Only $995. Fully automatic transmission. Heavy duty engine. Sells on sight to contractors, landscapers, municipalities. Big profits. Dealers, distributors, manufacturers' representatives wanted. Almost all territories still open. Write —President General Engines Co., Route 130, Thorofare, N. J.

CONTRACTOR'S EQUIPMENT

For Sale, Rental or Rental With Purchase Option

All equipment may be inspected on location at Rapid City, South Dakota, Beverly, Nebraska and Denver.

1—Lima 803 2½ cu. yd. shovel, Cummins power and torque converter.
1—Lima 802 2 cu. yd. shovel with 85' dragline boom and Cat engine.
1—Lorain 820 2 cu. yd. shovel with 65' dragline, Waukesha powered.
9—D8 Caterpillar tractor with No. 25 Cat power control units. Several 8R models, balance 2Us.
6—Caterpillar 85 dozers.
4—Caterpillar DW20's 18-23 cu. yd. capacity.
4—Woolridge Terra Cobra TC-S14 tractor scraper units, 15-18 cu. yd. capacity.
3—LeTourneau "W" Scrapers, 24.00 x 32 rubber.
1—LeTourneau "F" Scraper, 18.00 x 24 rubber.
2—Fleco rock rakes, complete with arms.
4—McCoy and Gebhart sheepsfoot rollers, heavy U.S.B.R. and U.S.E.D. type.
1—Galion No. 102 Motorgrader, IHC diesel powered.
1—Caterpillar No. 12 motorgrader.
6—Euclid 36 TD 22 ton end dump trucks, with Allison retarder brakes and Torqmatic transmission, Cummins 300 h.p. engine.
3—Ingersoll-Rand 600 C.F.M. Gyroflo air compressors.
1—Gardner-Denver 365 C.F.M. air compressor, Cat powered.
8—Cleveland DR34 3" and Ingersoll-Rand 4" Wagon drills.
1—Rex 34E dual drum paver.
1—Jaeger 16S concrete mixer.
1—Aggregate batch plant, complete with 2 cu. yd. Noble weigh-batcher, 4 compartment bunker bins, Cedarapids 3 deck aggregate shaker.

Also a large assortment of rock drills, paving breakers, air tampers, portable arc welders, hand power saws, radial saws, light plants (1½ to 10 KW), half ton to one ton pickup trucks—Ford F7 and F8 dump trucks, McCoy earth manipulator bars and 1½" to 6" pumps.

Assortment of ¾ to 3 cu. yd. dragline buckets—Esco, Page and Hendrix.

Call, Write or Wire

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3405 So. Lincoln St.
ENGLEWOOD, COLORADO
Ph. Denver, Colorado Sunset 9-1102
or Race 2-4181

SEAMAN-ANDWALL PULVIMIXER

Nearly new SEAMAN-ANDWALL Pulvimixer, only 117 actual hours operation. Seven foot mixing width, powered with GMC 471 engine, 10:00 x 20 front and 15:00 x 34 rear tires. This machine can't be beat for "Mix-In-Place" base material or soil stabilization. Sells new for over $13,000.00. Special price for quick sale $8,500.00, f.o.b., Amarillo, Texas.

THREE 18-24 YARD EUCLIDS

Three rebuilt 18-24 cubic yard EUCLID Tractor-Scraper Combinations. All tires new or near new, Cummins NHBS 275 H.P. engines. Units in excellent condition—have been completely rebuilt. Serial numbers 13613, 13733, and 13734. Price, f.o.b. Amarillo, Texas, $17,500.00 each.

Write — Wire — or Call

PLAINS MACHINERY COMPANY

Post Office Box 430
Amarillo, Texas
Phone: DRake 3-1747

SCRAPERS FOR SALE

1—Caterpillar 70
2—S-113 Bucyrus-Erie
1—12-yd. Heil

These scrapers are in good condition. We also have several good TD-18's with Double Drum Power Control Units.

ILLINOIS TRACTOR COMPANY

Mt. Vernon, Illinois

Phone 3053

FOR SALE OR RENT

Lima Diesel Crane. Model 602. 1½ yd. bucket and 30 ton crane capacity. 120 ft. boom, plus jib. Independent boom hoist. General Motors 174 HP diesel engine. Crawlers 16'10" long.

Price $20,000 f.o.b. car.

WHISLER EQUIPMENT CO.
1906 Railway Exchange Bldg.
St. Louis 1, Missouri

FOR SALE

LATE MODELS MIDWEST LOCATIONS

Manitowoc 3000-B's, 3500's erect cranes — shovels, long booms, wide long cats diesels. Also 2000-B's.
Northwest 6's, 80-D's, and 95 cranes — drags — shovels, diesels, wide long cats — long booms. Ind. BH's.
Bucyrus-Erie 38-B's, 51-B's, 54-B's, cranes — drags, shovels, diesels, wide long cats — long booms.
Marion, Koehring, Link Belt & Lorain model cranes — drags — shovels, wide long cats — diesels. Also backhoe equipped machines, all types.

JAMES C. FRENCH
226 Berry Pkwy. - Talcott 3-4927
PARK RIDGE, ILLINOIS

Coming . . . 1¾ Million Dollar Inventory

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Road Building — Construction — Concrete — Erecting — Rigging — Truck & Trailer — Office — Miscellaneous

NEAR-NEW, LATE MODEL EQUIPMENT

71 CRAWLER TRACTORS

40 CATERPILLARS, Incl. (2) D-9s, (18) D-8s, 15As, 14As, 13As and 2Us, (5) D-7s, (6) D-6s and (9) Trackson D-4s HT-4 Loaders • 18 INTERNATIONALS, Incl. (3) TD-24s, (4) TD-18As, (4) TD-14s and TD-9s • (12) ALLIS-CHALMERS Incl. (3) HD-20s, (3) HD-19s, (2) HD-9s, (4) HD-5 G Loaders and Dozers • Cletracs • Others.

16 EUCLID TRUCKS

(14) Bottom Dumps • (2) Rear-End Dumps • Late Models.

5 TRUCK CRANES

Michigans • Quickways • Others • Also Includes (1) Lorain 1957 Model MC-424 Tandem 25-Ton Mote Crane.

CONCRETE EQUIPMENT

Koehring 34-E Twin Batch Paver • Koehring Longitudinal Concrete Finisher • Blaw Knox Concrete Widener • Apsco Base Paver • Apsco Stone Spreaders • Blaw Knox Spreaders • Vibrating Screen • Paving Breakers • Concrete Cutters • Form Buckets • Large Quantity Road Forms • Many Other Miscellaneous Near-New Items.

22 MOTOR SCRAPERS

(8) Caterpillar DW-21s • (4) Le Tourneau-Westinghouse Model D Tournapull Roadsters • (5) Euclid Model S-7s.

29 CRANES, SHOVELS, BACKHOES

(4) Lima 44s • (3) Lorain L-50-Ks • (4) Lorain L-26s • (4) Lorain L-25-Js • (3) Bucyrus-Erie 38-Bs and 22-Bs • (1) Lima 1601 Shovel • (1) Ottawa HW-3 Hydra-Way Backhoe • Northwest 25s • Lima Paymasters • Link-Belt LS-52s, LS-51s and Speeders • Others.

23 MOTOR GRADERS

(2) Galion T-600s • (4) Adams 660s • (9) Caterpillar Model 12s, 8T Series • (2) Caterpillar Model 112s, 3U Series • Others.

MISCELLANEOUS

(2) Warner-Swasey M-2460 Gradalls • (2) Jackson Multiple Compactors • (3) LeTourneau-Westinghouse Tournapackers • 10 Scrapers Incl. (3) Caterpillar Model 80s, LeTourneaus, Heil and Others • LeTourneau Tournatractors with Dozers • (12) Rubber Tired Rollers, same to 50-Ton, Incl. Bros. Model 450s and SP-54s • (2) Near-New Michigan Shovel Loaders • Euclid Model 9-BV Loader • 1957 Austin-Western Hydraulic Yard Crane • LeTourneau Super C Tournatractors with Dozers • Le Roi Tractairs • Galion Trench Roller • (11) Double Drum Sheepsfoot Rollers • (21) Compressors, All Makes, Portable, up to 365 Cfm • Buffalo-Springfield 10 Ton Rollers & Galion 8-Ton Rollers • McCarthy Vertical Drill • Trenchers • Truck Mixers • Tandem Dump Trucks, Flatbeds & Pick-Ups • Flatbed & Lowboy Trailers • 200 & 300 Amp Portable Welders • Power Units, Generators & Light Plants • (18) Pumps, to 6" • Steel Tanks • Control Units • Pile Hammer • Clam, Shovel & Drag Buckets • Rooters • Lighting Equipment • Chain, Electric & Radial Saws, etc. • Rome Discs • Heating Kettle • Backripper • Root Rake • Winslow Road Scale • Boilers • Tampers • Beam Scale • Steam Cleaners • Plows • Structural & Scrap Steel • Shop & Machine Tools • Hundreds of other Miscellaneous Items which will be announced in our future advertisements . . . . . soon.

MISCELLANEOUS (Continued)

Each Item Will Positively Be Sold . . . . Without Price Limit or Reserve

Construction Job Site . . . Intersection of New U. S. Hwy. 40 & U.S. Hwy. 25 . . . 1 Mile South of Dayton Municipal Airport

Thurs, Fri, Sat Nov. 14-15-16 Dayton, Ohio

CATALOGS
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DO YOU HAVE SURPLUS EQUIP.?
For further details and information about selling some of your surplus equipment at this big Sale, write R & R Auction Office.

A SALE OF YOUR OWN?
Idle equipment into cash? . . . Retiring? . . . Reducing inventory? . . . INQUIRE TODAY!

3-YEAR PAYMENT PLANS
Available to All Buyers . . Regardless of Location

ROSS & ROSS
AUCTIONEERS, INC.

Wooddale Bldg. WAlnut 7-9997
MINNEAPOLIS 16, MINNESOTA

This Sale is arranged for the Smalley Construction Co., Celina, Ohio, after completion of a large Ohio construction project. This disposal is part of their now surplus inventory, most of which was purchased NEW during the past 24 months and regularly maintained in excellent condition.

FOR SALE

1—Hetherington-Berner Type T-60 Asphalt Plant complete with "Cat" D-397, 650 H.P., 350 KW Electric Set.

This plant is complete with everything but hot oil heater and if desired hot oil heater mounted in van can be purchased. This plant is completely equipped with all electric motors, Syntron vibrators and four compartment aggregate bins. This plant bought new by us Massachusetts Turnpike, manufactured 126,000 tons and was then dismantled, checked, repainted and been in storage in our quarry, Laurel, Maryland.

Also to go with this plant are 2 Blaw-Knox Paving Finishers. These 2 pavers are model PF-90 equipped with Hercules JXC gasoline engines and extensions for 13 ft. spreading. These machines have only laid the asphalt delivered by the above plant.

If interested write, wire or phone

Central Engineering and Contracting Corporation

DURHAM, NORTH CAROLINA

FOR SALE

Allis-Chalmers Model HD20 Equipped with a push plate - Good Condition $9,500.00

Northwest Mod. 25 Crane w/35' of boom and Rud-O-Matic tagline. No bucket. Only $6,950.00

Northwest Mod. 25 Shovel Front & accessory parts - all in good condition $700.00

The EARLE EQUIPMENT Co.
2424 28th St., S. E. - CH 5-9247
GRAND RAPIDS, MICHIGAN

PAGE 620 W. Walking Dragline, 6-7 cy., 115' boom, Page & Cummins diesels $37,900 ind.
BANTAM T35 Backhoe on CCC Motorcrane, new 1955, excellent. $6750 Yard.
BUCYRUS 22B Dragline, #58680, GMC diesel, rebuilt. $10,500 Yard.
GEGOOD Motorcrane, 15 ton, current mdl. 200, 55' boom, tandem drive, outriggers, rebuilt. Good. $6750 Yard. Rental Purchase.
NORTHWEST 25 Dragline, govt. surplus, 85' boom, good. $5500 Yard.
CAT. D8 Bulldozer #20885, w/8S dozer & 2S unit, new 1953, rebuilt. Excellent. $13,000 Yard.
GALION 102 Tandem diesel maintainer w/scarifier, UD14A engine. Good. $2000 Yard. Rental Purchase.
(4) DAVEY 210 cfm Super Chief Portable Diesel Compressor, on rubber, late model, rebuilt. Excellent. $2350 Yard. Rental Purchase.
GARDNER DENVER 500 cfm Portable Diesel Compressor, on rubber, Cat. D13000 diesel. New 1950. $3850.
HORIZONTAL Earth Drill w/48' of 12" augur, Wis. engine, new. Cost $1500 Sell. $850 Yard.
PITMAN mdl. 80 Hydrocrane on tandem L190 International truck, excellent.
T9 SWING CRANE, good. $3000.
LACROSSE 19 ton Tandem Lo-Boy. Good. $1850 Yard.
LAPLANTE CHOATE C84 18-cy. Scraper, good. $2850 Yard.
ROSCO 400 gal. Asphalt Distributor on semi-trailer. $500 Yard.
CLEAVER BROOKS 2-tank Car Heater, portable. $600 and $1250 Yard.

WENZEL MACHY. CO.
565 S. 10th St. Kansas City, Kans.
MAyfair 1-1710

For Sale

1—53x60 heavy-duty, double impellor, Iowa Mfg. impact breaker, complete with 50"x14'x6" heavy-duty cast manganese feeder. Used 7 months.

2—42" conveyors. One conveyor 155' long; the other 160' long. Used 7 months.

1—McCully gyratory crusher #11.

1—Marion electric shovel, Model 6RS.

Numerous other units including ½-yard to 2½ yard shovels; Murphy & GMC power units & generator sets. Screens, jaw crushers, rolls, bucket elevators, etc. Some units mounted on rubber-tired chassis.

Write for complete list and prices to:

Concrete Materials & Construction Co.
P. O. Box #790
Cedar Rapids, Iowa

Synchronous Motors CHEAP

312 KVA, 600 RPM, 440 Volt, Westinghouse $1,500.00
465 KVA, 1200 RPM, 2300 Volt, Ideal 2,000.00
480 KVA, 600 RPM, 440 Volt, General Electric 2,250.00

Gardena Machinery Exchange
17710 S. Figueroa St. - FAculty 1-0185
GARDENA, CALIFORNIA

FOR SALE 2, 1951

Model "D" Tournapulls, excellent shape, ready to work. My Banker says sell. Total price $14,000.00.

JIMMY DALE

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Phone DRake 3-8672

DEPENDABLE USED MACHINES
Bay City 150-T40 truck crane
Lorain L-41 crawler crane
Bay City 25 gasoline dragline
8' CMETCO #202 Rola Paver
Hopto 360 upper works only
77B Lorain 1½ yd. shovel front
TRACTOR & EQUIPMENT CO.
10032 Southwest Highway, Oak Lawn, Ill.

FOR SALE
CONSTRUCTION EQUIP.

848A Barber-Greene Portable Asphalt Plant. Cap. approx. 200 ton per hr. New 1955. Price: $75,000.

Serial #2U8734 with #25 CC and 8S Blade New Muldoon $9,500.

Serial #2016235 HI OUTPUT With push plate $9,000. All 3 for $23,000.

1 Northwest 25 Shovel Front Complete Excellent $2,000.

3 CT Le Tourneau Turnomatic Turnapulls. Serial #2823 Pr. $9,000; Serial #2826 Pr. $9,000; Serial #2008 Pr. $10,000; all for $24,000.

2 Euclid S 18 Series 27 LDT Serial #19000 with 27 SH Scrapers Series 9,000 New Modification Excellent $25,000 each. Both $47,500.

2 Euclid S TDT Series 13700 with 14 SH Scrapers Series 6000 completely Rebuilt at cost of $15,000. Each $22,000. Both $41,000.

3 DW 10 Cats. With #15 Scrapers Series 1V2600. Very Good $12,000. Each. All for $34,000.

1 Lima 502 Shovel and Dragline Combination D-17000 Engine Serial #3168. 70 Ft. Boom Paige or Hendrix Bucket 32 in. Extended Tracks. Excellent $31,500.

1 L80 Lorain Comb. Shovel and Dragline Series 14000 D 13000 engine. $7,500 spent on repairs. Excellent $22,000.

1 L50K Comb. Dragline and Camel Back Backhoe Series 23000 D318 Engine 50 Ft. Boom very good $20,000. Both L80 and L50K for $38,000.

1 DW 21 Cat. Series 5W 680 with #21 Scraper. Less than 2700 hours. Drive tires like new. Scraper tires 85%. Excellent $23,000.

1 Simplicity Asphalt Plant 50 ton per hr. Complete with Bins, Storage, Tanks, Dryer, Cummins Diesel Motor Frushauf Tool House Pr. $31,500.

5 Model FP LeTourneau Carryall Scrapers Series 33000 to 38000. Excellent. Each $3,750. All for $18,000.

848 Barber-Greene Portable Asphalt Plant. Cap. 100-150 tons per hour. Just rebuilt at cost of $16,000. Price: $80,000.

1 D8 Cat. Series 2U10700 with #25 CC. Excellent $9,500.

3 Terra Cobras Series 53000. Excellent. Each $11,500. All for $32,000.

1 Parsons Trenchliner Series 2300, Model 250 $8,500. Excellent.

3 HD 20 Allis-Chalmers Pushers Series 3700 to 4700. Priced from $10,000 to $13,000. Excellent.

1 D8 Cat. Serial #2U6005 No. 25 Cable Control and 8A Blade. Pr. $8,000.

1 D8 2U17884 with 25 cable control and 8A Blade. Pr. $10,000. Both for $16,500.

Powell Equipment Co.

P.O. Box 186 - Phone 2952
SALISBURY, NORTH CAROLINA

MUST SELL!

(3) ALLIS-CHALMERS TS300

MOTOR SCRAPERS

Serial No's T300B 601-1012-1057, Buda Diesel Power - Excellent shape and completely inspected - 4 new recapped tires for spares - tires on ground are good. Appearance excellent, low hours.

$33,000.00 Buys all three

F.O.B. Our Yard.

LLEWELLYN MACHINERY CORP.

Miami, Florida — Phone: HIghland 4-2541

FOR SALE BY OWNER
Attention Canadian Buyers

5000 lb. Simplicity Asphalt Plant, 2 years old $80,000.00

Joy-Sullivan 315 Diesel Air Compressor 2,500.00

16" Superior McCully Gyratory Crusher, as is, $4,000.00; with complete parts to rebuild, $6,000.00; completely rebuilt.. 8,000.00

Above items located Plattsburg, New York

Two 37½ Kennedy Van Saun fine bowl crushers, complete with motors and drives, only two years old. Each 10,000.00

Located Cobleskill, New York

Above Equipment in Excellent Shape, reason for selling replacing with larger equipment. May be seen operating. Available after October 30, 1957.

LANCASTER DEVELOPMENT INC.

Phone REgent 0900 - Box 192
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CONSTRUCTION EQUIPMENT
FOR SALE

3 ea. LeTourneau - Westinghouse Model "C" turnamatic 14 to 16-yard motor scrapers. 3,000 hours each. A-1 condition—good rubber.

3 ea. LeTourneau - Westinghouse Model "D" 7 to 9-yard equipped with scrapers and rock wagons. A-1 condition. With scraper and rock wagon attachments.

4 ea. Cat. D-4's with dozers. Excellent condition. Price 4 to 5 thousand each.

2 ea. 310 Parsons trenchers, used less than 700 hours each, equipped with rock buckets, rock teeth and rock shanks.

250 Parsons trencher equipped with front elevator to load trucks in alleys.

Pullman Standard Model 2000 — pull scraper, 20-25 yard. Almost new.

BBU Wooldridge pull scraper, 10-12-yard.

Link Belt Speeder, Model LS-80 equipped with dragline boom, Cat. 8800 engine.

Terms arranged to suit buyer

McMILLON CONSTRUCTION CO.

Phone SUnset 1-4445
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FOR SALE
BUCKET HANDLING BRIDGE CRANE

60' Span - 2 yard capacity. Mfd. 1948 by Whiting Corp. Condition excellent. 220/440 Volt A.C., with Keisler Bucket; also, 235' Runway Available.

Arnold Hughes Co.

2765 Penobscot Bldg. - WO. 1-1894
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FOR SALE

15B Shovel, 1951 Model International Diesel. Either Backhoe or Crane. Good condition.

15B Shovel, 1946 Model. Gasoline Motor. Either Backhoe or Crane. Fair condition.

1952 A-C HD-5 Hylift. Good condition.

1952 A.C. HD-5 Angle Blade Dozer. Good condition.

1951 D-4 Caterpillar Dozer. Good condition.

US 10 KW DC Generator Unit and controls. Ready for magnet work. Like new.

CALL:

UNITED EXCAVATING CO.

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FOR SALE

1—Foote Paver 34E, Single Drum, boom and bucket. Motor just overhauled, new mud rings, new discharge chute and extra parts, fins, etc. Ready to go. Repainted. Serial No. 49003. Model No. 34E $6,250.00

1—McKiernan-Terry Pile Hammer No. 5. May be used as "Double-Duty" Driver and Puller. Hammer is in excellent condition and ready to go to work. Now equipped with flat base 1,400.00

1—Hove Concrete Breaker with Interchangeable Heads and with 6-cyl. Red Seal Continental Engine 2,500.00

We also have a line of Cranes, Air Compressors and small Tools. Send for our complete list of Equipment For Sale.

L. W. WELLS CONSTRUCTION CO., INC.
1420 Miller St. - Saginaw, Michigan

FOR SALE

Cat. D4 front-end loader.

Davey 105 CFM Air Compressor.

Ferguson tractor, with Wagner loader and Pippin trench hoe.

Ace Equipment Co.

Route 17
Maywood, N. J.
Phone: Diamond 3-4488

FOR SALE

MARSH HAY & STRAW for Covering Hay

KOPFF HAY CO.

BEAVER DAM, WISCONSIN

BIG SAVINGS
BY BUYING
BOMBER TIRES!

Already Adapted - No need to change your present wheels. Tires are all Nylon construction and fully guaranteed.

TYPICAL EXAMPLES:

	PLY	TYPE TREAD	PRICE
1600x20	22	Rolling	$150.00
1600x24	32	Rolling	200.00
1600x25	32	Rolling	200.00
1800x24	32	Rolling	200.00
1800x25	32	Rolling	200.00
2100x24	30	Rolling	350.00
2100x25	30	Rolling	350.00
23.5 x25	30	Rolling	350.00
2400x25	30	Rolling	350.00
26.5 x25	30	Rolling	350.00
29.5 x25	30	Rolling	350.00
65"	26	Rolling	385.00

NOTE: ROCK LUG TREADS ARE AVAILABLE IN ALL SIZES.

EXTRA SPECIAL: 2 - 29.5x29 22-Ply NYLON TUBE TYPE TIRES - ROCK SERVICE TREAD - 20% WORN - NEW GUARANTEE .....$875.00 Each

PRIOR TIRE COMPANY
JAckson 2-8866
ATLANTA, GEORGIA

FOR SALE
USED CRUSHING PLANT
Used Crushing Plant

Cedar Rapids Master Tandem, with Caterpillar D-17000 Power Unit, completely portable with towing dollies. Tires in good condition. 40"x20" Rolls; 1036 Jaws; 12'x4' Double Deck Screen; 24"x36' Return Conveyor; 24"x22' Return Conveyor; 30"x40' Feed Conveyor; 24"x46' Delivery Conveyor; 18"x30' Fines Conveyor; 24"x48" Reciprocating Feeder; Air Brakes; Plant and Power Unit recently reconditioned. All new manganese; all Drives and Conveyor Rolls in good condition—ready to go to work; See it and buy it.

KEREMI TRACTOR AND EQUIPMENT CO.
Box 908 Phone 8-8922
Cheyenne, Wyo.

CURING COMPOUND FOR CONCRETE

WHITE
20 Drums or More 74c Per Gallon
Less than 20 Drums 85c Per Gallon

CLEAR OR DYED
20 Drums or More 62c Per Gallon
Less than 20 Drums 73c Per Gallon

Frank Gill Company
Manufacturers
Box 271
Wisconsin Rapids, Wisconsin

EQUIPMENT and MACHINERY FOR SALE

OSGOOD CRANE MODEL 805, 1¾ yd. Cat 13000 Motor. Can furnish hoe attachment. Complete machine used only 1200 hours.
BUCYRUS-ERIE, MODEL 54B drag or shovel attachment. Very good condition.
BUCYRUS-ERIE, MODEL 20B hoe and crane combination. Factory new Buda motor. Very clean.
LORAIN 82 shovel crane combination. Completely reconditioned.
2—D8 Cable Dozers.
2—D7 Dozers, cable.
2—D4 Cat. Dozers, Hydraulic Blades.
Cat. 12 Grader.
TL 20 Wagon Crane, self-propelled, GM Diesel.
LORAIN MC 4 truck crane.
2—BAY CITY ½ yd. 15-ton truck cranes. 40' Boom, Factory Carrier.
LORAIN L-41 Crane, drag and shovel combination. Cat. Diesel. Equal to new. No hours on motor.
2—LeTOURNEAU L.P. Pans. 12-15 yd.
1—LeTOURNEAU 6-8 yd. Pan.
LeTOURNEAU Super "C" Bottom Dump Model 210 Wagon. Like New.
NORTHWEST MODEL 25 - Crane, Cat. Diesel.
BARBER GREENE Crawler Coal Loader.
4—Mississippi Bottom Dump M.R.S. Wagons. $1,000.00 each.

MISCELLANEOUS

Cat. D4-400 Power Unit rebuilt. Skid Mounted.
GM 371 Power Unit. Skid mounted.
4—Koehring Model 304 Crane booms.
P & H Model 655 hoe attachment, 1½ yd. unused. $3,000.00
¾ yd. Essco Shovel dipper, will fit 22B.
1 yd. shovel dipper for unit.
N W 25 Fairleads.
P & H 255 Fairleads.
P & H 655 Fairleads.
Dragline buckets, various sizes. Best offer.

TESTA BROS., INC.
Richmond Road P. O. Box 36
Bedford, Ohio BEdford 2-5151

COMPLETE ASPHALT PAVING SPREAD
All in good condition
Ready to Operate.

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Two Pneumatic Tires. Like new.

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GRADING & CONCRETE PAVING EQUIPMENT

1—D-8 Cat Tractor w/angle blade & DDP unit, S/N 2U5173.....$10,000.00

1—D-8 Cat Tractor w/angle blade & DDP unit, S/N IH8690..... 7,000.00

1—D-8 Cat Tractor w/push plate & DDP unit, S/N IH8122..... 7,000.00

1—D-7 Cat Tractor w/push plate & DDP unit, S/N 7M4127..... 5,000.00

1—Scraper, GarWood 25 cubic yard, S/N 5231 ..... 5,000.00

All this equipment in extra good condition and ready to do a job. Should be inspected to be appreciated. All this equipment is subject to prior sale. Contact us for prices on any not priced.

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P. O. Box 52 - Phones: 145K12 or 165
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Steel Sheet & H Piling
We Buy—Sell—Rent Piling
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800 pcs. DP 2-30', 40', 50' & 60'
286 pcs. ME 27-30' & 47'
3900 pcs. SP 6A-44', 80' & 65'
300 pcs. SP 4-30' & 60'

PORTABLE CRUSHING PLANTS
15"x24" Primary Portable Crusher, Model 15-A Diamond Crushing Plant, 15"x24" Jaw Crusher 30"x8' Apron Feeder, Hopper, 24"x28' Conveyor, Gasoline Engine, on Pneumatic Tires.

SECONDARY PORTABLE CRUSHER
Model 3A Cedarapids Portable Crushing Plant, 24" x16" Double Roll Crusher, 3'x8' Vibrating Screen, 4 Belt Conveyors, Gasoline Engine, on Pneumatic Tires.

R. C. STANHOPE, Inc.
00 East 42nd St. - New York 17, N. Y.

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At Reasonable Prices

Cat. D82U16422, 25 ccu completely rebuilt. Cat. 8U Gravel Dozer like new.

Cat. D25U1394 like new with Rear power take-off. Used only as farm tractor.

Cat. DW10 IV Series 5300-gal. water wagon. Tank being fabricated.

Cat. DW10 1B 736. No. 10 Cable Scraper in excellent shape.

Cat. No. 12 diesel motor grader. 7T273 being rebuilt. Big tires, cab, lights, starter.

If you don't see what you want on our list, we will try to find it.

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"KNOWN FOR SERVICE BEFORE AND AFTER SALES"
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1 Gradall model 2460, Serial #23571.
1 Gradall model, 2460, Serial #20471.
1 D-1 Case Hi-Lift.
1 200 Amp. Welder.
1 1½ Ton F8 Ford Dump Truck, 1950.
1 2 Ton F8 Ford Dump Truck, 1948.
1 Battery Charger.
1 Spark Plug Cleaner.
1 Vise.
1 Jaeger 2" Water Pump.
1 Telsmith Gyrator Crusher, 5 H Electric Motor.
1 Feeder Belt & Conveyor 14'9" x 30", Electric Motor.
1 Feeder Belt & Conveyor 120' x 24" Electric Motor.
1 Vibrator Screen, Electric Motor.
1 Bucket Belt 120' x 12", Electric Motor.
1 20 Ton Scales.

FARBIZO SLAG, INC.
P. O. Box 31 - Phone: 5-3761
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3—Used S-7 Euclid overhung tractor scrapers with 4-71 GMC diesel engine with 1800x 25 16 ply tires.

2—Used Model 23TDT-21SH Euclid 15½ yard scrapers with 6-110 GMC diesel engine

These scrapers are in good working condition and are priced to sell quickly.

CONLEY-LOTT-NICHOLS MACHINERY CO.
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3000 B Manitowoc Crane, excellent condition.

DICK CORPORATION
LARGE, PENNSYLVANIA
(Pittsburgh district)
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Littleford Spraymaster Asphalt Distributor, 1970 gal. cap., A-1 condition.

3-Ton Apsco Roller

Adnum Jr. Paver

Cedarapids Asphalt Plant.

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P.O. Box 236, New Hartford, N.Y.

For Quick Sale: Complete concrete batch plant including hopper, loaders, scales, and 3 Rex Moto-Mixers 3 yd. capy. with 4½ yd. aggregate on White Trucks. M. Selige, Panhandle Pipe & Steel, Borger, Texas.

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1—1946 ADNUN 10' Black Top Paver, S/N 1422, in good condition.....$3,000.00
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Model 16E Koehring Twinbatch Paver S/N 24066. Standard water tanks. Ad-Mix Distributing System. Powered by General Motors Diesel Model 2055 S/N 2A9661. Tires in good condition. Machine overhauled and in fine condition $9,000.00

Parsons Ditcher Model 88 S/N 2508, Self propelled on rubber tires. Digs 5′ deep and 12″ wide. Powered by Hercules JX4C5 gasoline engine S/N 2552741. Overhauled and in good working condition... $5,000.00

Parsons Ditcher Model 221 S/N 1977. Machine powered by Waukesha gasoline engine S/N 114020. Equipped with 24″ bucket line and digs 9′6″ bucket line goes with machine. Machine is in very good condition $6,500.00

Heltzel "Detroit Special" Transverse Finishing Machine, 20′-26′ adjustable finishing width. S/N O-149. New in 1953. Equipped with hydraulically operated pneumatic tired transportation wheels.. $6,750.00

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McKiernan-Terry and Vulcan Pile Hammers and Extractors
Boilers, Hoists, Derricks, Cranes Compressors, Railroad Equipment, Etc.

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TRUCKS WANTED

Highest dollar value paid for new and used trucks and all kinds of used equipment. All types of truck equipment bought and sold, including war surplus.

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Vandeventer Auto Sales
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Ph. Franklin 1-1750

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USED EQUIPMENT

International TD14 Tractor, S/No. 15461 with Bucyrus-Erie Hydraulic Dozer. Good operating condition, cleaned and painted. Previously owned by a Nebraska County.

Oliver OC-3 Tractor with WARE hydraulic loader. Operated about 1650 hours. Works good.

Hyster D7 Hystaway Attachment for CAT D7 Tractor 3T-4T-7M series, 30′ boom, good operating condition except hook rollers are slightly flat.

Austin Western "Badger" — Crane, drag or hoe. Powered by IHC-WD9 Diesel). Needs small amount of boom work, otherwise good.

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MISSOURI VALLEY MACHINERY COMPANY

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CATERPILLAR DW 21. Low hours. Excellent condition throughout.

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DES MOINES, IOWA

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BANTAM—"M-49" ⅜ yd. Trench Hoe, mounted GMC 6x6.

SARGENT—"410" *New* ⅜ yd. Hoe or Crane, mounted on new Crane Carrier. Substantial discount.

INSLEY—"K-12" ½ yd. Trench Hoe, Crane or Dragline, (2).

LORAIN—"TL25" Used ¾ yd. Diesel Dragline.

MARION—"331" ¾ yd. Shovel or Dragline.

BUYERS—"83" Used ¾ yd. Crane or Dragline.

LINK-BELT—Shovel attachment complete for LS-85 (¾ yd.)

LOADERS

CATERPILLAR—"D-4" Diesel Tractor w/ Trackson Tractor Shovel. Rebuilt tracks and engine.

CATERPILLAR—"D-6" Diesel Tractor w/Hi-Lift Cable Traxcavator, 1950 model in fine shape.

ALLIS-CHALMERS — "HD-5G" Used Diesel Tractor w/Trackmotive Front End Loader, Rebuilt tracks and engine.

INTERNATIONAL—"TD-9" Used Diesel Tractor w/Bucyrus-Erie Hydraulic Tractor-Dozer.

PETTIBONE—"10" Used 1 yd. Tractor Shovel, 4-wheel drive.

HOUGH—"HM" Used 1½ yd. Tractor Shovel, 4-wheel drive.

BARBER-GREENE—"545-46-3" Used Rubber-Tired Bucket Loader.

HAISS—"75W" Used Rubber-Tired Bucket Loader, 2½ yrs. old.

HAISS—"75C" Used Crawler Bucket Loader @ $2,000.

MISCELLANEOUS

GRUENDLER—"1024" Roller Bearing Jaw Crusher.

PETTIBONE-WOOD—"820A" New Windrow Proportioner. Reduced for quick sale.

PETTIBONE-WOOD—"P620" Used Preparizer, G-M Power, Diesel. Will rent or sell.

BAYPORT—23 yd. New Aggregate Bins.

REX—4½ yd., Hi-Discharge Moto-Mixer, Reconditioned, Un-mounted.

JAEGER—3 yd. (4½ yd. Agitator) Hi-Discharge mixer, 1945 model, mounted on 6-wheeler. Cheap.

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10 x 78 DRYER. 4′ & 3′ SYMONS cones. Pioneer 54 x 24 double roll. 5360 Impactor. 6 x 14 rod mill. 42 x 48 & 84 x 66 jaws. CRUSHING EQUIPMENT: Jaw crushers - Rolls - Cones - Gyratories - Rod, Ball & Tube Mills - Hammermills - Impactors - Portable Plants. Bins - Bucket Elevators - Classifiers - Compressors - Conveyors - Cranes - Derricks - Drills - Dump Cars - Engines - Feeders - Generators - Hoists - Kilns & Dryers - Locomotives - Motors - Pumps - Screens - Shovels & Draglines - Transformers - Euclid Trucks - Weightometers.

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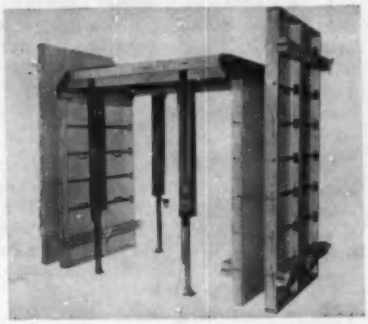
New Products

(Continued from page 154)



Symons Form

with a 45-degree angle surface 8½-in. wide between wall and roof. It comes in lengths of 4, 6, and 8 ft. and is produced for use with both metal frame and wood frame forms. Special size forms are available on order.

For more details circle 136 on Enclosed Return Postal Card.

Tar Kettle Burners for Rapid Transport and Quick Heat

Speed, cleanliness, safety, convenience and economy are claimed by the Flamegas Detroit Corporation, 12901 Auburn Ave., Detroit 23, Mich., for their new liquid propane burner for tar and asphalt kettles. These burners develop a 2000 degree flame temperature immediately and are designed to deliver 500,000 BTU per hour, or lower as desired.

Flamegas Burner

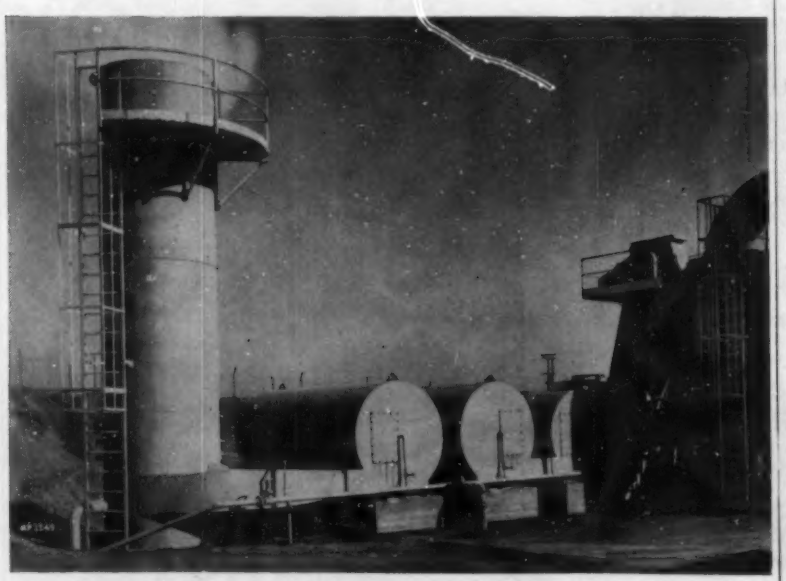
For more details circle 137 on Enclosed Return Postal Card.

Triple Wet Tube Dust Washer for Asphalt Plants

Madsen Works, Baldwin-Lima-Hamilton Corp., Construction Equipment Division, 14120 East Rosecrane Ave., P.O. Box 38, La Mirada, Calif., has developed a triple wet tube dust washer for the purpose of dust abatement and air washing of asphalt plant dryer exhaust to meet requirements of air pollution control. The unit is an addition to other washers now in the Madsen line.

The assembly is designed to withstand the corrosive effect of dilute acids resulting from fuel combustion. It is readily serviced through manholes in the ends, with sprinkler manifolds easily removed in one assembly, assuring low-cost maintenance.

for more details circle 138 on enclosed return postal card.



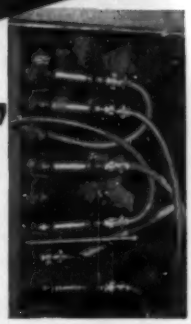
Madsen Dust Washer

Avoid One Cause of Air Line Leaks and Pressure Loss

"BOSS"

Self-Honing

AIR VALVES



Female I. P. T. Both Ends

Built to withstand the hard knocks of mining and construction service, "BOSS" Valves are also ideal for general use on pipe lines, hose lines, compressor tanks, etc., and for the handling of water. They do not require packing.

Bronze plug firmly seated by spring tension against harder metal of valve body is automatically honed to perfect seat as handle is turned. A straight, full-flow opening extends through valve body and plug, providing greater capacity with no friction loss. Valve opens or closes by a quarter turn of the handle.

INTERNALLY ATTACHED HANDLE— In sizes ¾" to 1½" valve stem and handle are combined in a strong one-piece forged steel unit which is anchored to the bronze plug within the valve body. This patented feature eliminates stem and handle breakage. Sizes ¼", ⅜", ½" and 2" have externally riveted handles.

Male I. P. T. Both Ends

Stocked by Manufacturers and Distributors of Industrial Rubber Products

DIXON

Valve & Coupling Co.

GENERAL OFFICES & FACTORY—PHILADELPHIA 22, PA.
BRANCHES—CHICAGO · BIRMINGHAM · LOS ANGELES · HOUSTON
DIXON VALVE & COUPLING CO., LTD., TORONTO Associate Companies

For more details circle 257 on enclosed return postal card.

With the Manufacturers and Distributors

W. J. LARKIN has been appointed technical consultant by Cataphote Corp., Jackson, Miss., in connection with traffic engineering problems and applications. Duties will include advisory service to cities, counties, states, etc., in planning and use of traffic signs, striping, and other non-electric traffic control products. Prior to joining Cataphote "Bill" Larkin was the Michigan State Highway Depts. traffic superintendent in charge of all sign shops, construction and maintenance of signs and markings.

CONSTRUCTION MACHINERY DIVISION of the CLARK EQUIPMENT CO., Benton Harbor, Mich. has appointed three new distributors to sell and service the Michigan line of earthmoving and material handling equipment. They are: G. H. Godsoll Equipment, Ltd., 435 Keating St., Toronto, Ont.; Arrow Contractors Equipment Co., 4646 S. Kedzie Ave., Chicago, Ill.; and Da-Nite Equipment Co., Route 51 and Samuelson Rd., Rockford, Ill.

SANFORD TRACTOR & EQUIPMENT CO., Reno, Nev., has been appointed a distributor of the Bucyrus-Erie Co. in western and central Nevada and in northeastern California.

MR. W. R. "BOB" MEADOWS, founder and president of the W. R. Meadows Inc., Elgin, Ill., passed away on July 15, 1957.

W. R. Meadows

Mr. Meadows founded his firm in January, 1926 and brought it to a position of prominence as a manufacturer of asphaltic products, including the line of "Sealtight" products.

Mr. Meadows was a member of the Elks, V.F.W., American Legion and Chamber of Commerce. He was an officer and member of the board of directors of the Expansion Joint Institute and was active in many other national business organizations. Harry G. Meadows, his son, will continue as head of the business.

W. J. CATALANE has been appointed district sales manager for Wooldridge Mfg. Div. of Copper and Steel Industries, Inc., for the New England states and New York, New Jersey, Pennsylvania and Maryland.

THE NOBLE CO., Oakland, Calif., has opened a new branch office at 2512 West Mockingbird Lane, Dallas, Tex. Robert L. Baxter, formerly of the Los Angeles office, is in charge of the new location.

EMIL E. GROB has been appointed earthmoving representative in the eastern sales division of Caterpillar Tractor Co. Joseph M. Johnson has been appointed earthmoving representative in southwest sales division.

CLARK EQUIPMENT CO., Benton Harbor, Mich., has appointed two new dealers to sell and service the Michigan line of tractor shovels, tractor dozers, and excavator cranes of the Construction Machinery Div. They are Fuchs-Clayton Machinery Co., 901 S. 4th St., Omaha, Neb., and The Island Supply

WHAT ABOUT YOU, MR. READER?

Are you still active in the field? Have you moved or changed your position?
Unless you send this information directly to us we can't be sure. Sometimes a reader's name is cut from the mailing list because we are not sure that our information as to name, title and address is right. *Your* name might be cut from the mailing list.

Don't Let This Happen to You

Even if you think we know all about you, please fill in the information requested below and send to us by return mail. Our auditors require proof of accuracy of our mailing list. *You* are the only person who can help us on this. Do it now before you forget, so you can be sure your magazine will always be properly addressed to you. New names cannot be added or old names retained on our list unless we have *all* this information. *Please print or type.*

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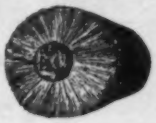
FIRM NAME OR GOVERNMENT DEPARTMENT (give street address) _____

_____

CITY _____ ZONE (if any) _____ STATE _____
(If you have moved give *old and new* address)

SIGNATURE _____

YES! YOU CAN BUY DIRECT
NEW ROTARY SWEEPER CORES
WE SHIP WORLDWIDE IMMEDIATE SHIPMENT
WE MANUFACTURE ALL SIZES



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1000 rooms with radio and MUZAK from $3.75
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400 fine rooms from $4
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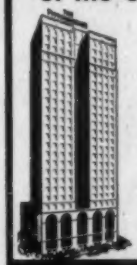
AIR-CONDITIONED
HOTEL KNICKERBOCKER

Hotel PITTSBURGHER
PITTSBURGH, PA.

Right in the heart of the Golden Triangle



400 outside rooms with bath. Large-screen television and radio at no extra charge in every room. Air conditioning. Finest dining room.

ATlantic 1-6970

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AMherst 4-5152

Joseph F. Duddy, Gen. Mgr.

Co., 1221 W. Oklahoma Ave., Grand Island, Neb.

WILFRED R. LEWIS, a field sales manager with the company's Canadian subsidiary the past two years, has been appointed a district sales manager for the Pacific Northwest territory by Four Wheel Drive Auto Co., Clintonville, Wis.

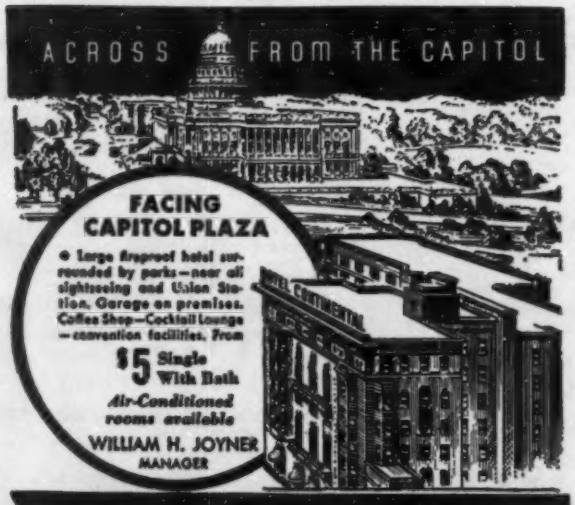
HANSON EQUIPMENT CO., Beloit, Wis., has been appointed distributor in Wisconsin and Iowa for The Rowco Mfg. Co., Keene, N. H., producer of brush cutting equipment.

ROBERT K. MORGAN has joined Reilly Tar & Chemical Corp., Indianapolis, Ind., as sales representative in the eastern territory.

DUANE A. HOUKOM, heretofore southeastern district manager, has been promoted to sales manager of Atlas Copco Eastern Inc.'s stationary compressor division.

HENRY P. LOCKHART has been appointed assistant general manager of Austin-Western Construction Equipment Div., Baldwin-Lima-Hamilton Corp., Aurora, Ill.

ACROSS FROM THE CAPITOL



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$5 Single With Bath

Air-Conditioned rooms available

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MANAGER

HOTEL CONTINENTAL
WASHINGTON
D. C.

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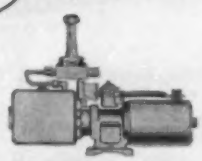
MONARCH Controls Your Plow
. . . automatically!

JEEPS

TRUCKS

POWER MONARCH HYDRAULIC CONTROL

Snow removal is fast, dependable and safe with Monarch Power Hydraulic Control Equipment . . . cab-controlled for one-man instant action, the Monarch zips snow plows into operation with ease and speed. Fan-belt driven or Electric models are available for practically all makes of vehicles. Proven in service everywhere, over 50,000 Monarch Controls have been sold. See your dealer or write for full details.



The Monarch DYNA-MIGHT Model HEP (as illustrated) combines all ports in one package for ready installation on new or existing equipment.

MONARCH
ROAD MACHINERY COMPANY
1331 MICHIGAN STREET, N.E., GRAND RAPIDS 3, MICHIGAN

. . . for more details circle 288 on enclosed return postal card

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JOB REPORT FROM GOLDSBORO, N. C.

on the new CAT* DW15 (Series E)-No. 428 LOWBOWL Scraper

Whenever a new machine is introduced, this question comes up: "What'll it do on a job?" Reports from actual jobs in different sections of the country show there's a definite answer for you on the new Caterpillar DW15 (Series E)-No. 428 LOWBOWL Scraper. Compared with competitive units of similar capacity, this new earthmover heads the pack with high production.

Here are facts and figures from a contract on U. S. Highway 117 near Goldsboro, N. C. The contract, handled by S. T. Wooten Construction Co., Stantonsbury, involved moving about 3,000,000 cu. yd. of material in a section 2.3 miles long. The material was coarse, moist sand (70%) and clay (30%). Hauling loads of 14.1 bank cu. yd., the DW15 (Series E) unit averaged 7.02 round trips an hour on a 3,600-foot cycle. Details are shown in the box to the right.

From every angle, the new DW15 is designed for high production at low cost per yard. Its Caterpillar Engine packs 200 HP (maximum output capacity). With speeds up to 37.2 MPH plus the stability of four wheels, it delivers fast round-trip hauls with greater safety than two-wheel rigs. Its new wide-section 26.5 x 25 tires provide maximum flotation. And the new No. 428 LOWBOWL Scraper (13 cu. yd. struck, 18 cu. yd. heaped), provides a faster loading rate clear to the end of the loading cycle.

For comparative cost-of-operation figures on other actual jobs, see your Caterpillar Dealer. He's a source of reliable information. Ask him to show you proof that the new DW15 (Series E)-No. 428 can pay off for you! Name the date—he'll demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

JOB DATA ON DW15 (SERIES E)-NO. 428*

Material: Coarse moist sand (70%) and clay (30%)	
Round-trip distance	**3,600′**
Average load time (min.)	**1.06**
Average haul time	**3.28**
Average turn and dump time	**.61**
Average return time	**3.61**
Average cycle time (incl. delays)	**8.56**
Average trips per hour	**7.02**
Bank cu. yd. per trip	**14.1**
Average hourly production (bank cu. yd.)	**99**

**The unit was push-loaded by a D8*

CATERPILLAR*

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DEPT. RS-10, Caterpillar Tractor Co.
Peoria, Ill.

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New Jersey completes 164-mile Parkway

Equipment like this performed the heavy grading, which preceded construction of the pavement.

Last 9 miles, like most of Garden State Parkway, are paved with heavy-duty, lower-cost Asphalt.

Applying Texaco Asphalt during construction of 7-inch Asphalt (Penetration) Macadam foundation.

The chain of popular summer resorts along the New Jersey shore are now reached in a fraction of the time formerly required, thanks to the new Garden State Parkway. This toll road is another example of the use of heavy-duty, smoother-riding, lower-cost Asphalt construction on modern, limited-access expressways.

Both the foundation and wearing surface of the final 9-mile section of the Parkway just completed were constructed with Texaco Asphalt. The 7-inch foundation is Texaco Asphalt (Penetration) Macadam, laid in two courses. The 2½-inch wearing surface is hot-mix, hot-laid Texaco Asphaltic Concrete. Shoulders on both sides of each 24-foot lane have a Texaco Asphalt (Penetration) Macadam wearing surface.

The flexibility of Garden State Parkway's asphalt base—asphalt surface construction enables such a pavement to maintain complete, lasting contact with the supporting subbase. That is why Asphalt successfully withstands heavy traffic impact year after year, also why Asphalt usually costs less to maintain.

This heavy-duty type of Texaco Asphalt construction is recommended for Interstate Highways. Its economy, compared to rigid paving designed for the same traffic, becomes increasingly important with rising road building costs.

Two helpful booklets on all Asphalt types of road and street construction may be obtained without obligation by writing our nearest office.

Laying second course of the 2½-inch hot-mix Texaco Asphaltic Concrete wearing surface.

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